WHO-EM/RPC/016/E

Report on the

Eastern Mediterranean consultation for establishing a regional biotechnology network

Teheran, Islamic Republic of Iran
31 July–2 August 2004

World Health Organization
Regional Office for the Eastern Mediterranean

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EXECUTIVE SUMMARY

The Eastern Mediterranean consultation for establishing a regional biotechnology network was held in Teheran, Islamic Republic of Iran from July 31 to August 2004 for representatives of selected centres of excellence in (health-related) molecular biology, biotechnology and genomics in the Eastern Mediterranean Region. The meeting was sponsored by the WHO Regional Office for the Eastern Mediterranean. The purpose of the meeting was to initiate the establishment of a regional genomics and biotechnology network.

The first day of the consultation focused on keynote presentations that included the experience with genomics and biotechnology in the Islamic Republic of Iran; role of the International Commission for Genomics and Biotechnology in networking and developments of genomics and biotechnology particularly in developing countries; country presentations on the current status genomics and biotechnology in health; and approaches and models in research coordination and management.

During the second and third day of the meeting, the participants split in three groups. The objectives of the group discussion were to discuss various issues, problems and challenges in genomics and biotechnology development in the Region and to make recommendations for the creation of a regional Health Genomics and Biotechnology Network to support regional and national efforts.

The groups agreed on the need to:

- Promote health genomics and biotechnology development in Member States
- Make better and wise use of existing capacities and resources through mutual sharing of expertise and exchange of information
- Improve quality of research and development to address priorities
- Seek support of policy and decision makers for genomics and biotechnology development
- Support the creation of national biotechnology bodies to formulate policies to support (health) genomics and biotechnology and its application in public health in the Member States
- Collaborate with other key stakeholders including industries academia, related sectors of civil society.

The participants agreed that the key challenges to research and development in genomics and biotechnology include:

- Lack of communications among stakeholders
- Limited capacities in manpower, material and finances in research and development in genomics and biotechnology
- Insufficient focus on health biotechnology and institutional research and development is not in congruence with national priorities
- Lack of team spirit, coordination and a systems approach for genomics and biotechnology development

- Restrictions imposed by the industrialized world on (mostly) Muslim nations: new world order and the deliberate, systematic dwarfing of genomics and biotechnology development in developing countries by the industrialized world.

Key points of discussion among the participants included:

- Role of WHO/EMRO in supporting the regional genomics and biotechnology network
- Responsibilities of Member States in support of the regional genomics and biotechnology network
- Role of governments, civil sectors, private sector (industry) community
- Goals/direction of the regional genomics and biotechnology network
- RBN secretariat and management mechanisms of RBN including mandate and responsibilities (during the initial establishing phase).
- Membership and role of partners in RBN.

An ad hoc committee was established, with an interim secretariat at the Pasteur Institute, Teheran, Islamic Republic of Iran. The Committee was assigned the task for initiating the regional genomics and biotechnology network, and recommendations were made regarding the mandate of this committee.

1. INTRODUCTION

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The consultation was held at the Pasteur Institute in Teheran. His Excellency Dr Masoud Pezeshkian, Minister of Health and Medical Education, inaugurated the meeting. Dr Mubashar Sheikh, WHO Representative in the Islamic Republic of Iran, delivered a message from Dr Hussein A. Gezairy, WHO Regional Director for the Eastern Mediterranean. Dr Hossein Malekafzali Ardakani, Deputy Minister for Science and Technology, Islamic Republic of Iran, gave an overview of the Iranian experience in genomics and biotechnology development.

Delegates from Bahrain, Egypt, Islamic Republic of Iran, Jordan, Kuwait, Morocco, Oman, Pakistan, Saudi Arabia, Sudan, Syrian Arab Republic and Tunisia attended the consultation. Professor Mohammad Hassar (Morocco) and Dr M. Mohammadi (Islamic Republic of Iran) were elected Chairperson and Rapporteur of the meeting respectively. The agenda, programme and list of participants are included as Annexes 1, 2 and 3, respectively. The full text of the message from the WHO Regional Director is attached as Annex 4, and the inaugural speech of the Minister of Health and Medical Education is attached as Annex 5.

2. OBJECTIVES AND METHODOLOGY

Dr Mohammad Abdur Rab

Collaboration among institutes to create networks and partnerships for information exchange, training and research was an important recommendation of the renewed health research policy for development in the Region, articulated by the Forty-eighth session of the Regional Committee for the Eastern Mediterranean in 2001 in resolution RC48/R.8. This point was reiterated at the 20th meeting of the Eastern Mediterranean Advisory Committee for Health Research in August 2002. In September 2003, at a meeting of the regional experts on genomics and public health policy, the need to develop a broad regional consensus, vision and policy for genomics and biotechnology development was emphasized. At this meeting, WHO/EMRO and the Standing Committee for Science and Technology of the Organization of Islamic Countries (COMSTECH) were urged to provide coordination and networking with national biotechnology bodies and to consider a regional fund to support research and capacity building in genomics and biotechnology.

The consultation was an outcome of the meeting in 2003. Specific objectives of the consultation were the creation of a regional biotechnology network; development of a framework for action and milestones for the regional biotechnology networking in genomics

and biotechnology; and definition of priorities for applied research in genomics and biotechnology.

In order to accomplish these objectives, it was necessary for the participants to identify key issues, challenges and priorities, explore opportunities and mechanisms for collaborations, and focus on developing clarity of role, functions and responsibilities of the partners within the network. The network should also play a lead role in identifying potential areas for research, harnessing funds for research and initiating joint research projects in applied health genomics and biotechnology.

Discussion

There was a general consensus that the overall support to research funding both in the public and private sectors within the Region is low and that priorities lie elsewhere in sectors other than health. However, there is evidence that despite declining economies, many countries within the Region are now investing more in science than before. The participants felt that it was crucial to ensure that whatever is being allocated to health research is being spent judicially and wisely, and for this, networking is critical. It was pointed out that in order to establish networks, it was important that institutes in developing countries forge links with those in the industrialized world. This would stimulate advancement in relevant capacities within the developing world. Hence South–South collaboration should be alongside North–South partnerships in the area of genomics and biotechnology. Building such partnerships requires careful consideration; partnerships should ensure that all partners profit equitably, and the health interests of developing countries remain uncompromised. It was also noted that not all countries (and institutes) participated in the regional consultation. This was in part due to the fact that this was the first (but not the last) meeting of this kind, and also in part due to limited funds restricting larger participation. In due course time it was hoped that as the networking is established, the numbers will grow.

3. NATIONAL PROGRAMME FOR RESEARCH ENHANCEMENT IN HEALTH SCIENCES NETWORKS IN THE ISLAMIC REPUBLIC OF IRAN

Dr Sirous Zeinali

There are over 80 centres that are actively engaged in health research in the country. The national molecular medicine network was created in 2000, with the purpose of improving research management and for creating necessary, adequate and relevant infrastructure in this field in the post genomic era. Two other (related) networks were later created in the country, namely the national network for medical biotechnology and the national network for herbal medicine. There are currently 33 national centres that are members of the national molecular medicine network.

The national molecular medicine network functions through a board of directors and comprises a research committee and several technical committees such as medical, genetics, cancer and infectious disease committees. Its activities include undertaking research projects and information dissemination through news media, seminars and conferences. The website

for the network, www.irnolmednet.ir, contains details of all relevant information regarding the network and its activities. Some of the current activities and achievements of the network include: establishing other related networks; creating several molecular genetic laboratories for infectious disease diagnosis; developing vaccines (against leishmaniasis and early trials of the vaccine) and other products; building capacity and developing human resources in molecular sciences; helping develop perinatal and prenatal genetic disease programmes; and creating a national bank of genetic materials.

4. MOLECULAR BIOTECHNOLOGY NETWORK IN THE ISLAMIC REPUBLIC OF IRAN

Dr Fereidoun Mahboudi

At present, the United States of America leads the market share of biotechnology products, but its share is slowly declining and developing countries are capturing the void thus created. Monoclonal antibody derived products, recombinant protein products, and vaccines dominate the current market, but transgenic animals and plant systems are rapidly emerging.

The molecular biotechnology network was established in 2002 with a special grant of over US$ 1 million. The main aims of the network are to utilize the services of the centres of excellence, share resources (human and material) and help capacity-building and policy development at the national level. Six national institutes of the country are members of this network, namely the Pasteur Institute, National Research Centre for Genetic Engineering and Biotechnology, Razi Institute for Vaccine Development, Sharif University, Tarbiat Modaris University and Medical Universities of Teheran, Shiraz and Mashad.

The network makes invests in the development of infrastructure and technical know-how in protein characterization, recombinant drug production and vaccine, gene sequencing and gene banks. Some of its active projects include development of diagnostic kits such as recombinant HTLV1/2, cancer diagnostics based on monoclonal antibodies, *H. pylori* detection kit and biopharmaceuticals.

Discussion

The participants expressed the view that although there is need for greater investment in research by national governments, the national institutes in the Region should not rely solely on support from public sector. Collaboration with multinational companies through mutually agreed upon commitments should be sought for continued sustenance. It was discussed that the focus of application of biotechnology and genomics products development should be balanced between diagnosis and prevention of infectious, chronic and genetic diseases. It was pointed out that since the objective of establishing such networks is ultimately for public benefit, the networks should involve all stakeholders, from both the public and private sectors. Close cooperation and integration between academic centres and the ministries of health would help coordinate research and application of biotechnology and genomic products at primary health care level.

5. INTERNATIONAL NETWORKING IN BIOTECHNOLOGY: INTERNATIONAL COMMISSION FOR GENETIC ENGINEERING AND BIOTECHNOLOGY AND ITS ROLE IN DEVELOPING BIOTECHNOLOGY

Dr Shahid Jameel

The main deficiencies in developing countries with specific regard to the field of genomics and biotechnology include lack of scientific and technical capacities, lack of access to propriety technologies, weak and diverse biosafety regulation and intellectual property rights regulations, poor investments and difficulty in access to information. In developing countries, the need to build the science of genomics and biotechnology is acute and therefore the need for building capacities is central to the application of biotechnology to the field of public health.

The International Commission for Genetic Engineering and Biotechnology (ICGEB) comprises 51 countries and a network of 35 affiliated centres. The two main components are in Trieste (Italy) and New Delhi (India). The mandate of ICGEB is to serve as resource to provide support for research and training in genetic engineering and biotechnology in the developing countries. ICGEB cooperates with the United Nations in activities that relate to:

- safe and sustainable use of genetic engineering and biotechnology
- protection of biodiversity
- biosafety and risk assessment
- implementation of Articles of the Biological Weapons Convention.

ICGEB operates with an annual budget of around US$ 12 million, contributed mainly by Italy, India and some member countries, as well as from international partners such as the European Union, Wellcome Trust, WHO and others. It provides grants and fellowships (including doctoral and post-doctoral programmes) and conducts training programmes and seminars, meetings etc. Details can be obtained through its website, www.iceb.org.

The research focus at its two centres in Trieste, Italy, and New Delhi, India are distinct but complementary. The centre in Trieste focuses on molecular medicine, virology, microbiology and bacteriology, protein structure and bioinformatics, molecular pathology and leukocyte biology, muscle molecular biology, molecular immunology and biotechnology development. The research focus of the New Delhi Centre is on issues related both to human health and agriculture. The main areas of interest at this centre include malaria, virology, immunology, recombinant gene products, structural biology and bioinformatics, plant molecular biology, plant transformation, stress resistance and insect resistance.

ICGEB seeks collaborative partnerships with scientists, institutions and industries in ICGEB member states. Some examples of the technology transferred from ICGEB New Delhi include: hepatitis B vaccine to India, Sri Lanka, Islamic Republic of Iran and Egypt; hepatitis C diagnostic kits to India and Sri Lanka; plastid transformation to the United States of America; and biopesticides to India.

Discussion

The participants agreed that given the vast experience of ICGEB in networking and collaboration in genomics and biotechnology, it would be in the interest of regional networks and institutes to develop links with ICGEB. The regional network on genomics and biotechnology should also explore mechanisms to initiate linkage with ICGEB. The linkage of universities to public sector was emphasized exemplifying the case in India where the national biotechnology department, realizing the need to develop HIV diagnostics, engaged one university and two research centres to develop rapid diagnostic tests. Within a period of three years, two products were developed and made available in the market. The participants pointed out that in many cases of international collaboration, there are divergent interests of collaborating partners; centres in the industrialized world are usually interested in developing high tech research products through research carried out on easily available materials from developing countries.

Issues of research and patent development in the Region (as well as in the developing world) and their impact on developing countries were raised. Not all centres and universities have expertise in patenting. The mechanisms of access of research results to industry favour institutes in the industrialized world. Private sector investment is low in the Region. The research management in academic institutes in the Region is not product oriented and there is little exchange of scientists between universities to the industry, as opposed to the situation in the industrialized world.

6. SUMMARY COUNTRY PRESENTATIONS

6.1 Bahrain

The Biotechnology Department of Arabian Gulf University of Bahrain focuses research on medical molecular diagnosis, signalling immunology, development of *Leishmania* vaccine and related health topics. A wide range of other research topics are also addressed by the Department, including molecular biology, enzymeology, protein biochemistry and cell biology. Clinical genetic services started in Salmaniya Medical Centre in 1984 to study the genetic diseases in the country. The hereditary disease programme was aimed at conducting epidemiological studies on the prevalence and trends of genetic disorders among Bahrainis, planning to reduce the prevalence of such diseases, and improving the standard of management and treatment of patients.

6.2 Egypt

The Egyptian Organization for Biological Products and Vaccines (VACSERA) is considered one of the main research centres in Egypt and the Middle East area for the production of vaccines, sera and biological products. VACSERA has current manufacturing facilities for oral poliovaccine, bacille Calmette–Guérin, diphtheria-tetanus-pertussis vaccine, albumin, γ-globulins and other vaccines, blood components and fractions. The main

responsibilities of VACSERA are to serve the government and the trade sector requirements regarding vaccines, sera and biological products, through local production and/or importation.

6.3 Jordan

In Jordan at least four research and training centres are actively involved in biotechnological and genomic research. Of these, the Department of Biotechnology and Genetic Engineering, Jordan University of Science and Technology, is actively involved in molecular genetic diagnostic and related research. In addition, two private pharmaceutical companies are also involved in biotechnology research for production of drugs and related compounds. The Higher Council of Science and Technology has established the Virtual Centre of Biotechnology and Network, aimed at stimulating interaction and knowledge sharing among Jordanian and other Arab scientists working in various fields of biotechnology.

6.4 Kuwait

Biotechnological research is currently being conducted by the Kuwait Institute for Scientific Research and University of Kuwait. The main focus of the Institute is on diagnosis, vaccine development, pharmaceutics, pharmagenomics and bioinformatics. There is a plan to establish a new Biotechnology Centre in the country. Funding for health research in Kuwait is ensured by the Kuwait University Research Fund, Kuwait Foundation for the Advancement of Science and Environment and Environment Public Authority.

6.5 Morocco

In Morocco, several institutes are involved in biotechnology activities. Those under the Ministry of Health are undertaking health-related biotechnology activities. The Pasteur Institute of Morocco, National Hygiene Institute and Centre for Transfusion are actively involved in research areas pertaining to human genetics, genetic basis of allergies, genetic diagnosis of infectious diseases and blood molecular biology. The Ministry of Research is aiming to establish a network of institutes working on related subjects.

6.6 Oman

In Oman, the Ministry of Health and Sultan Qaboos University are the centres of genetic research. These institutes have collected epidemiological data on genetic diseases and particularly focused on research pertaining to prevention of genetic blood diseases. Due to a comprehensive national programme, the birth prevalence of genetic blood disorders has been reduced by 10%.

6.7 Pakistan

Over the past few decades, Pakistan has developed a sound base for research in biotechnology and genetic engineering. There are now several institutes actively involved in health-related biotechnological research. These include the National Institute of Biotechnology and Genetic Engineering, Faisalabad; Centre of Advanced Molecular Biology,

Lahore; Kahota Research Laboratories, Islamabad; Institute of Biotechnology and Genetic Engineering, Karachi; Life Sciences Institute, Lahore; Agha Khan University, Karachi; and HEG Research Institute of Chemistry, Karachi. In addition, several other departments under the Atomic Energy Commission, Higher Education Commission and ministries of health, science and technology are involved in health-related biotechnological research activities. In light of the growing need for planning and coordination of biotechnological research in the country, the Government of Pakistan has constituted a National Commission on Biotechnology. Most of the health related biotechnological research in Pakistan pertains to genetic disease, particularly hearing impairment, thalassaemia, chromosomal abnormalities, forensic biotechnology and stem-cell research.

6.8 Saudi Arabia

In Saudi Arabia, the health-related biotechnological research base has a broad scope that covers autosomal recessive diseases (e.g. cystic fibrosis), chronic diseases (e.g. diabetes) infectious diseases, generic bio-drugs and bio-remediation. Among the major players in the field of biotech research are Jeddah BioCity, research centres in universities, research centres in hospitals, and Saudi Pharmaceutical Industries and Medical Appliances Corporation (SPIMACO). The vision of Jeddah BioCity is to create a nucleus foundation for biotechnology and its applications in the Middle East. The mission statement of the company underlines three elements critical to its vision: transference of biotechnology, high economic return and serving the community.

6.9 Syrian Arab Republic

The biotechnological base in the Syrian Arab Republic is the Department of Molecular Biology and Biotechnology (MBB) in the national Atomic Energy Commission. The Department has at least three divisions, Mammalian Cell Biology Division, Human Genetics Division and Mammalian Physiology Division, involved in planning, management and active participation in biotechnological research pertaining to health-related problems. The Radiation Medicine Department under the same commission has sequencing facilities and expertise. These departments are striving to acquire facilities for research in bioinformatics and stem cells and informatics with particular emphasis on human health.

6.10 Tunisia

Major biotechnological and genetic research activities in Tunisia are undertaken in the Pasteur Institute of Tunisia. Research programmes in the Institute are often collaborative, linking different local or regional organizations including universities, other institutions, French national agencies and international agencies. Numerous topics are addressed by the Institute which involve biotechnological, bioinformatics and molecular genetic techniques.

7. RESEARCH COORDINATION AND BIOTECHNOLOGY DEVELOPMENT: LESSONS FROM A DEVELOPING COUNTRY

Dr Somsak Chunharas

There are several research funding agencies and research institutions in Thailand that are engaged in research, although product-oriented research is still weak. Increased emphasis on technology development and biotechnologies began in 1992 with the establishment of the National Biotechnology Centre. Assessment of research and funding is now given on the basis of patents produced as research outputs, and not just papers produced.

The objectives of the biotechnology programme in Thailand are to:

- support research to develop medical products such as new drugs, new rapid and accurate diagnostic tools and new effective vaccines against tropical diseases;
- strengthen collaboration between Thai and foreign scientists through support in publications, patents and technical know-how;
- strengthen collaboration between Thai and foreign scientists by supporting exchange of investigators and to promote their training in specialized fields in Thailand and abroad;
- develop human resources by encouraging scientists to accomplish specific goals which would build their capabilities and career patterns within the national health research and development and biotechnology development.

Dr Chunharas described the structure, management and the functioning of the national biotechnology development programme, its accomplishments and ongoing research in the country in this field. The dengue research and vaccine development project was an outcome of the increased national focus on the application of biotechnology for public health, and the significant role of networking nationally as well as with international research and development partners in the success of this project.

Coordination is crucial for all stages of research and development in most developing countries because of limited research capacity and scarcity of private enterprise in health technology. Countries prefer to strive towards creating self-reliance or become generators/owners of new technologies and not merely act as an insignificant partner (or, worse, subcontractor) of global multinational giants. Therefore, effective coordination is needed at many different stages, for instance in concerted planning with concrete targets, in getting key partner (national/international) commitments and in ensuring that the research projects meet planned deadlines.

Research towards product development requires management practices that are different from the conventional research-granting management. These include: the need for a dedicated full-time product manager; commissioning research; and identifying and negotiating with competent groups and agencies help to increase efficiency and adherence to planned objectives and targets. It is important to build up infrastructure and practices aimed at product-oriented research, and strong and continuous political support is crucial.

Discussion

The need for interaction among scientist through meetings, seminars and courses was stressed by the participants. This is not only necessary to advance knowledge but also in building partnerships. It was pointed out that the networking in genomics and biotechnology should also be goal-oriented. The goals should be based on existing expertise and links, and this will result in enhanced knowledge and capacities. The culture of interchange of scientist between the academia and industry is relatively recent and more widespread in the industrialized world. It can also be applied in the developing country settings, but it is important that the ultimate goal in such linkages should be for public benefit.

8. GROUP WORK

8.1 Group work 1: rationale and modalities of the establishment of a regional networking in genomics and biotechnology in health

Summary

The participants split in three groups with specific tasks to discuss and make necessary recommendations on creating a regional health biotechnology network.

The groups agreed that a regional network was crucial for the Region. The Region must not be left behind in the rapid developments in science and technology that are vital for improvements in health and national economy. The need for networking is more acute in the current global political environment, where transfer of technology to the developing world has become increasingly difficult, especially for the Muslim world. Strategies should therefore be put into place whereby the development of science and the utilization of the knowledge and skills can play a role in national development. Insufficient action by the scientific community and national policy-makers poses grave risks and could result in further widening the health and economic gap between the rich and the poor nations.

The regional network can therefore serve as a catalyst for change by providing an opportunity to build partnerships, share experiences and information and develop the urgently needed technologies through improved research, training programmes and better (and more economical) use of resources. The network could actively support and encourage collaboration between research institutions and industry. It could serve as a platform to communicate with and educate the public and for generating support to influence national policy makers to make appropriate investments in the science of genomics and biotechnology for public health benefit. The regional network can generate financial resources for genomics and biotechnology. The groups identified: a) the key challenges for the regional network on (health) genomics and biotechnology, b) crucial factors for it to be successful; and c) salient activities the network should perform.

a) Challenges for the regional network on genomics and biotechnology in health

- There is lack of communication and coordination between scientists and researchers to share knowledge and experience. The scientists and researchers work in isolation, there is lack of teamwork and little will or desire to interact.
- There is a lack of focus on national priorities. The research is mostly driven either by individual interest or by donor compulsion. This leads to extreme variation in the kind and quality of research. This fragmentation does not only limit the utility of such efforts, but also serves as a deterrent to forging links that are aimed at common goals and objectives in national interest.
- The development of genomics and biotechnology in Member States is skewed to sectors other than health such as agriculture and animal husbandry, industry, petrochemical and others, as these are seen as development sectors. The potential of health genomics and biotechnology for national growth as has not yet been fully realized and therefore political support for health sector biotechnology and genomics is lacking. The scientific interaction and exchange between genomics and biotechnology in the different sectors is weak.
- Restrictions are increasingly being imposed by the industrialized world in the area of science and technology on (mostly) Muslim nations in the new world order scenario and there are deliberate and systematic attempts to discourage genomics and biotechnology development in developing countries by the industrialized world.
- Financial investments, particularly in health genomics and biotechnology, are small and capacities (both human and material) are weak.
- The overall national environments, vision and management processes necessary for developing science and technology in the Region are not present. Low literacy and public ignorance contribute significantly to the lack of developments in this field. School and university education in the area of genetics are of a poor quality and standard.

b) Crucial factors for success

- There is need for the partners to commit to common goals and a vision to pursue the stated goals and objectives. The interaction between the partners should be based upon dynamic and mutual understanding of each other, and should be conducted in a clear and transparent manner.
- The partners in the network need to realize and understand the added value and benefits to their own strengths as a result of being a member of the Network.
- The network must function independently of the influence of governments and international organizations such WHO and others. It should have its own mandate and system of governance.

c) Key activities of the regional network

- Generate a database for each country including information and list of centres of excellence and scientists.

- Develop a website with hyperlink to all other members of the network to share information
- Develop and support national networks in health biotechnology in the Member States.
- Develop linkages with the identified national focal persons in genomics and biotechnology.
- Establish a regional secretariat for the network.
- Engage in organizing education and training programmes, meetings, seminars and dissemination of information related to health genomics and biotechnology.
- Engage in constructive dialogue with stakeholders such as private sector, industries, health managers and related social sectors.
- Provide technical support to partners for developing skills and capacity strengthening in research and development for health care technologies.

Discussion

The participants felt that the nature of the networking should be clearly defined from the outset; it is important to consider whether this entity is to function as an association or a network. There is also need to identify modalities of funding for sustenance of the network, whether it will rely on public funds or nongovernmental and private sources. It is necessary to consider the role of the network as being both advisory and implementing, and to determine how best the network can carry out these functions.

The participants pointed out that both the short-term and long-term goals of the Network need to be clearly defined. It was suggested that funding for the short-term goals could be obtained from the governments; however, the funding for achieving long-term goals should come from the private sector, including industry. With respect to the role of WHO, the participants felt that it should be more of a catalytic function. WHO could help in the initiation of a network building process, provide advocacy support for the network to the national governments, and provide technical support to research activities carried out in the partner's institutions of the network.

It was pointed out that while autonomy of the network is necessary, it should be borne in mind that the public sector in the Region is the major investor and stakeholder in the development of science and technology, including that of the health sector. Private sector investment in this field is very weak in the Region, and therefore there is little chance of acquiring sufficient financial support from the private sector at least for the time being. It is therefore necessary for scientists to interact with national governments and convince the decision-making authorities of the benefits and role of the network in supporting genomics and biotechnology development for health within countries.

The participants finally discussed the modalities for the establishment of the regional network in genomics and biotechnology in health. It was proposed to form a steering committee, and the role of the member institutes should be to support the committee and provide advice consultancy and competencies to the committee. The synthesis of this discussion is captured in the sections on future actions and recommendations.

8.2 Group work 2: Regional priorities for research in applied genomics and biotechnology

Group 1: Priorities for applied genomics and biotechnology research in infectious disease diagnostics, prevention, diagnosis and control and bioinformatics

Research priorities should aim at:

- developing a database of disease situations from different countries
- developing rapid diagnostics for control infectious diseases especially those with a potential to detect rapid outbreaks
- developing a repository of control materials and improving quality control
- developing techniques for education, training workshops for establishing advance technology centres (i.e. microarray, proteomics)
- developing genotyping capacities.

The group recommended that applied genomics and biotechnology research in infectious disease should be focused on national infectious disease burden and priorities within the viral, bacterial and parasitic spectrum. Focus should be on applying the new biotechnology related products and tools for prevention, early detection and treatment of infectious diseases. Regarding priorities in bioinformatics, the group recommended the incorporation of a bioinformatics curriculum into national molecular biology programmes and development of a database of bioinformatics centres.

Group 2: Regional priorities for applied genomics and biotechnology research chronic disease genomics and biotechnology

The group noted that advances in genetics provide an opportunity for improved understanding of diseases and a challenge to translate this knowledge and technology into public health services. Several Member States are experiencing an epidemiological transition, with increasing proportion of morbidity and mortality due to genetic disorders and birth defects. Health systems in these nations have not responded appropriately to the rising needs of genetic services.

There is still a burden of unmet needs in other areas of health, such as infectious diseases, malnutrition, prenatal care, labour and delivery care and neonatal care. The medical profession and public health officials do not consider genetic conditions a priority.

The public is largely unaware about genetic risks and the possibilities of prevention, and there are misconceptions such as that genetic services are always high-tech and prohibitively expensive and are concerned only with rare diseases. Very little can be done to improve the health and quality of life of affected individuals and their families and genetics is closely linked to issues of abortion.

The group also mentioned barriers in the application of genomics and biotechnology such as the lack of vision understanding knowledge in genomics and inability to use its

advantages in public health. The science of genomics is constantly evolving, and hence there are uncertainties associated with results of the products and applications of genomics and biotechnology. Huge amounts of data are generated in genomics and biotechnology, and there are issues related to their generation and use. There is shortage of trained human resources and expertise in genomics and biotechnology, and other pressing priorities in health care generally take precedence over genomics and biotechnology derived applications.

The group felt that it was essential that genomics and biotechnology technologies be integrated into public health programmes, as genetic variations can be thought of as risk factors for diseases, and identifying the variations in populations will help in targeting public health interventions.

The group felt that research in health-related medical genetics in the Region is necessary to: update the state of development of medical genetic services; assess the major ethical, legal and social implications of the development of medical genetics; establish a regional network of cooperating centres to plan research and services on the application of genetic/genomic knowledge to improve health; develop a system to disseminate results of research to the general public and policy makers; improve efficiency and avoid overlaps by promoting collaborative research projects among academic institutions; and prioritizing research projects on diseases of impact and significance to the public's health. The research direction should focus on the epidemiology of genetic disorders and congenital malformations such as:

- determination of prevalence at birth, type, and medical and psychosocial cost of genetic disorders and congenital malformations in the countries of the Region;
- establishment of programmes to prevent exposure to teratogens in pregnancy;
- fortification of staple foods with folic acid, taking into account regional diets;
- conduct of feasibility studies for the detection of fetal malformations.

The group identified certain common chronic diseases such as cancer, cardiovascular conditions, diabetes, obesity where applied research in genomics and biotechnology is necessary. The group highlighted the current trends of research in applied genomics and biotechnology, including areas of:

- community genetics, epidemiological studies
- human genome diversity
- positional cloning
- common mutations
- mutation spectrum
- chromosomal disorders, such as thalassaemia, sickle-cell anaemia
- genetic diseases, like chromosomal, single gene and common disorders
- disease prevention, like premarital screening, preconception and prenatal problems and neonatal screening.

The group felt that the regional priorities for research and development in applied genomics and biotechnology can be classified as immediate and long-term, and made

recommendations for both types. Immediate priorities include: genetic epidemiology, community genetics and needs-assessment studies; studies aimed at improving performance of the specialized regional reference services and laboratories in clinical genetics, cytogenetics, clinical biochemical, genetics, molecular genetics and genetic counselling; and quality assurance and evaluation.

The long-term priorities include: improving infrastructure and capacity building; integrating genetic services into primary health care; creating centres of excellence for diagnosis and for collaborative research on specific diseases; and conducting human genome diversity and genotype-phenotype correlation studies.

Discussion

The participants viewed the two presentations as a broad agenda and suggested that the priorities should be narrowed and more focused, and developed as an empirical evidence-based exercise. The priorities should also take into account the existing capacities for research and development in genomics and biotechnology in the Region. At the same time, it is necessary to build capacities for research and development in genomics and biotechnology so that the research base in this field is strengthened and better quality research is then carried out. The focus should be on application of research in the field through development, field testing and integrating research products within the national health care and delivery contexts.

Participants highlighted the role of research oriented to product development. It was pointed out that the patent rights of many common drugs (and vaccines), which, until now are held by mega industries operating from the industrialized world, are soon expiring. Developing countries therefore must be ready with necessary skills and expertise to compete to obtain these patents rights and develop market their own products. This will not only provide the much needed vaccines and drugs to those who are suffering (and at much cheaper rates) but also will serve as potential for national growth. The general consensus among the participants was that research must address priorities with respect to the disease burdens and the feasibility and effectiveness of the intended products and interventions. Networking among different partners and stakeholders can play a significant role in setting the overall agenda for health research and development in relation to the application of genomics and biotechnology for public health.

9. FUTURE ACTIONS

- Dr H. Malekafzali Ardakani, Deputy Minister for Science and Technology, Ministry of Health and Medical Education, Islamic Republic of Iran offered to host the first EMHNB Secretariat and bear the costs involved in running the Secretariat. The participants acknowledged the offer and agreed to the proposal

- The host institute would be the Pasteur Institute, Teheran. Dr Ali Haeri, Acting Director General and Director of Research, Pasteur Institute, will be the Secretariat coordinator.

- The Secretariat will remain at the Institute Pasteur, Teheran, until the end of December 2006, after which the Secretariat will move (rotate) to another agreed upon location.

- Members of the Ad Hoc Committee of EMHGBN

  Dr Shaikha El Arrayed, Salmaniya Medical Complex, Bahrain
  Dr Ahmed Hamdi, EGYTEC, Egypt
  Dr Fereidoun Mahboudi, Director, Molecular Biotechnology Network, Islamic Republic of Iran
  Professor Mohammad Hassar, Pasteur Institute, Morocco
  Professor Riad Bayoumi, Sultan Qaboos University, Oman
  Dr Zahoor Ahmed, Centre for Applied Molecular Biology, Pakistan
  Dr Sultan Bahabri, Jeddah BioCity, Saudi Arabia
  Dr Ali Haeri, Acting Director General and Director of Research, Pasteur Institute, Secretariat Coordinator, Islamic Republic of Iran

10. RECOMMENDATIONS

General

1. The network should be named the Eastern Mediterranean Health Genomics and Biotechnology Network (EMHGBN).

2. Responsibility for hosting the network secretariat should rest with Member States. The Secretariat should rotate among the Member States after a defined period of time.

3. Membership should be open to all interested partners in Member States.

4. There should be a Steering Committee of the EMHGBN network comprising senior health scientists and researchers and responsible for advising on policy and strategic directions, establishing priorities for research and development, and overseeing implementation and evaluation. Until a steering committee is appointed, the task should be assigned to an ad hoc committee (comprising up to 7 members and a coordinator selected by consultation participants). The term of the ad hoc committee should expire by end December 2005.

5. The mandate of the ad hoc committee should be to:

   - promote advocacy for creation of national biotechnology networks and identify national focal persons for liaison
   - oversee the establishment of an EMHGBN
   - develop a genomics and biotechnology country database
   - articulate EMHBN vision, goal, mission, terms of reference, guidelines and propose priorities and strategic action plan for collaboration
   - solicit appointment of a Steering Committee for the EMHGBN.

Role of national governments

6. The EMHBN should engage national governments to promote genomics and biotechnology through greater investment in education science and technology, institutional capacity strengthening, framing legislation and encouraging multisectoral as well as private sector involvement in health genomics and biotechnology.

7. The EMHGBN should be endorsed by the WHO Regional Committee for the Eastern Mediterranean.

Role of WHO

8. The Regional Office should strengthen its capacity in genomics and biotechnology to enhance its role in regional efforts towards genomics and biotechnology development.

9. WHO should facilitate the establishment as well as the continued sustainability of the EMHGBN through the following activities:

- advocacy for investments in national (health) genomics and biotechnology through policy-level forums such as the Regional Committee and the Regional Consultative Committee
- facilitating and providing opportunities for interaction between EMHGBN partners
- facilitating South–South and North–South linkages involving EMHGBN partners and institutes in industrialized countries
- supporting research and development and training in genomics and biotechnology.

Mechanisms for funding

10. Member States should allocate specific funds in the biennial regular budget (JPRM planning) to support the EMHGBN.

11. EMHGBN should harness funds for research and development projects through national governments and international donors and organizations within (and outside) the Region such as COMSTECH, ISESCO, IDB, GCC, TWAS, ICGEB, Global Fund etc.

Annex 1

AGENDA

1. Inauguration

2. Overview of national biotechnology networking in the Islamic Republic of Iran

3. International networking in biotechnology: ICGEB and its role in developing biotechnology with special reference to developing countries

4. Country situation in (health) biotechnology networking in Member States

5. Approaches and models in health research coordination and management: case illustrations

6. Working group discussions on the role of networking in genomics and biotechnology applications in:

    - Disease diagnostics
    - Drugs and vaccinations
    - Clinical genetics
    - Bio-informatics.

Annex 2

PROGRAMME

Saturday 31 July 2004

08:30 – 09:00	Registration
09:00 – 10:30	Opening Session Opening address Chief Guest Participant introductions Selection of Chair and Rapporteur(s) Purpose and expected outcomes of the workshop Discussion
10:30 – 10:50	Plenary Session I: National biotechnology network in the Islamic Republic of Iran: A national strategy for capacity building on genomics and biotechnology *Professor H. Malekafzali Ardakani*
10:50 – 11:10	An overview of two national biotechnology networks National Molecular Medicine Network, *Dr Sirous Zeinali* Medical Biotechnology Network, *Dr Feraidoun Mahboudi*
11:10 – 11:30	Open discussion
11:30 – 12:00	International networking in biotechnology: ICGEB and its role in developing biotechnology with special reference to developing nations *Dr Shahid Jameel*
12:00 – 12:15	Open discussion
12:15 – 16:00	Country situation in (health) biotechnology networks in Member States (Each presentation to last 10–15 minutes), *Country representatives*
16:00 –16:45	Plenary session II: Approaches and models in research coordination and management: Case illustrations, *Professor Somsak Chunaras*
16:45 – 17:00	Open discussion
17:00 – 17:30	Introduction to break-out groups; purpose, objectives and expected outcomes from the groups

Sunday, 1 August 2004

08:30 – 14:00	Group work 1
14:00 – 16:00	Group work 2
16:00 – 17:30	Plenary session III: group work presentations

Monday, 2 August 2004

08:30 – 11:30	Recommendations from group work
11:00 – 12:00	Concluding session Presentation of final recommendations
12:00	Closure of meeting

Annex 3

LIST OF PARTICIPANTS

BAHRAIN
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Mashhad University of Medical Sciences
Mashad

Professor Hossein Malek Afzali Ardakani
Deputy Minister for Research and Technology
Ministry of Health and Medical Education
Teheran

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Ministry of Health
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Atomic Energy Commission
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Tunis

Facilitators

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INDIA

Professor Somsak Chunharas
Secretary General
National Health Foundation
Bangkok
THAILAND

WHO Secretariat

Dr Mubashar Sheikh, WHO Representative, Islamic Republic of Iran,
Dr El Fatih El Samani, WHO Representative, Oman
Dr Mohamed Abdur Rab, Regional Advisor, Research Policy and Coordination, WHO/EMRO
Dr Aida I. Al-Aqeel, Genetics, Metabolic and Endocrinology, WHO/HQ
Ms. Amani Kamal, Secretary, WHO/EMRO

Annex 4

MESSAGE FROM THE WHO REGIONAL DIECTOR FOR THE EASTERN MEDITERRANEAN

Distinguished Participants, Ladies and Gentlemen

It is my pleasure to welcome you to the beautiful country of the Islamic Republic of Iran and to this consultation on establishing a regional biotechnology network. In many ways this is a landmark meeting, for it is a gathering of experts from some of the leading institutes of science and technology in the Eastern Mediterranean Region who are here to combine their strengths and help nations to provide better health to their people and to fight disease.

At the dawn of the 21st century, we find ourselves at a crossroads. On the one hand, we continue to witness the tremendous development in the field of health services, unparalleled in any other period of human history. This health revolution has brought about huge reductions in disease and mortality, and better understanding of disease pathogenesis, prevention, diagnosis and cure. On the other hand, sadly, we are witness to the fact that the health revolution we speak about has left out over a billion people in the developing world. The disparities and inequalities in access to proper health care provision are glaringly obvious, not just worldwide but also within the countries of our Region. Even within countries, the distribution and delivery of health care is often distorted, to the disadvantage of the poor, the marginalized and the weak. Each year more than 500 000 women worldwide die during pregnancy and childbirth of causes that are preventable. The majority of these deaths are of women from developing countries.

Technologies, when skilfully applied and used in a coordinated and focused manner, can have far reaching impact on global health and development. Increasingly better and better tools are invented for the sole purpose of improving health and minimizing disease and its burden. Health inventions are now a source of economic development in much of the industrialized world. Unfortunately, we live in a world where the understanding, perceptions and distribution of fairness, equity, justice, knowledge, wealth, power and health are all skewed. Low-income and middle-income countries account for some 92% of the global disease burden, yet over 90% of health resources and research are targeted at problems that affect only 10% of the world's population. The rapid pace of evolution in biotechnology in the industrialized countries is threatening to widen the gap further between them and the developing countries. It is therefore imperative for developing countries to reach out now and make use of these technologies. Otherwise the bridging of the health divide in our global village will remain a dream beyond reach.

Funding for health care in many countries of the Eastern Mediterranean Region is limited. The decision to invest in biotechnology must be carefully weighed against proven existing interventions and long-term objectives. There is already ample evidence that the fruits of research and development in biotechnology not only augment epidemiological and clinical approaches to health care, but also contribute significantly to overall national economic growth. It is therefore of paramount importance that we adopt approaches to

develop biotechnology within the Region. Utilizing and sharing existing resources, networking and focusing on priorities will maximize the much needed benefits in this field.

Several countries have already developed and established well recognized centres of biotechnology. Egypt, Islamic Republic of Iran, Kuwait, Morocco, Pakistan, Saudi Arabia, Tunisia and United Arab Emirates are some leading examples. However, the focus of investments in biotechnology in the Region has largely been in sectors other than health. Application of genomics in crop development and food technology is outstanding, as is research and development in veterinary biotechnology. Countries are producing high quality native crops and fruits and some are already exporting their products to other countries. The camel breeding centres in Saudi Arabia and United Arab Emirates are among the worlds finest. The water desalination, industrial waste-refining and oil preservation technologies are well established in some of the member countries of the Gulf Cooperation Council. Many countries in the Region are now investing in biotechnology applications, such as the use of molecular biology and immunological markers for infectious disease diagnosis, although on a limited scale. But access to these technologies is restricted and costs are high. A number of countries now have reasonably well established centres for research and development in clinical genetics, molecular-based disease diagnosis, and drugs and vaccines.

These efforts, however, have not yet had the desired overall impact. The reasons are many, and include lack of skills and capacity-building. Perhaps one key factor impeding science and research is our inability to share information, skills, and resources. Take the example of the Human Genome Project. The scale of its enormity is unprecedented in the history of biology. Yet neither the USA nor any other industrialized country could ever have accomplished this alone. The success of this project has been the culmination of a coordinated effort between hundreds of scientists working in China, France, Germany, Japan, United Kingdom and United States of America, who worked together for a common goal. Networking, linking and sharing information exemplify the successful models of genomics development in countries, such as Brazil, Cuba, India and others. Networking enabled Brazil to complete the first sequence of a bacterial pathogen within a short period of two years. The country now ranks alongside the United Kingdom and United States in research aimed at deciphering the genetic basis of cancer. Cuba leads the list of developing countries where the research and scientific industry has thrived. Through its integrated network of biotechnology facilities, that country has produced the anti-meningococcal vaccine against type B meningitis, which is now being exported to the United States. This is a rare example where technology transfer from a developing country to the industrialized world is now happening. India is working to develop a malaria vaccine through collaborative partnership involving national and international institutions.

While industrialized nations dominate global science and technology, developing countries lack avenues of learning and opportunities to acquire knowledge. Scientists and researchers are sometimes barred from travelling to institutes in the industrialized world in order to study. They face difficulties when they try to publish their research results in leading international scientific journals, not always on grounds of quality but because of the inherent and often unfounded bias of the editors, who are mostly from the industrialized world. The Islamic countries have been hit the hardest in recent years. Our countries therefore must

ensure that they do everything possible to acquire the knowledge, the know-how and the skills to deliver better health care to their people. Nobody is going to do it for us. We have to rise to the challenge ourselves. This gathering provides you with an invaluable opportunity to discuss and debate on how best this can be achieved. I sincerely hope that you will earnestly work together to explore ways of building sustainable partnerships and linkages among yourselves.

WHO has a number of collaborating centres in Member States in the Region in different health disciplines, including the fields of biogenetics, molecular biology and biotechnology. I am glad to note that some of the WHO collaborating centres are represented here. During the last meeting of the regional collaborating centres in Cairo, I recall the need for developing active networks among the collaborating centres was also clearly articulated. I eagerly await your recommendations and your plan, and would like to reiterate the support of the Regional Office to your efforts.

Finally, I would like to take this opportunity to thank you once again for taking time to come to this important consultation. I am very thankful to the Ministry of Health and Medical Education, Islamic Republic of Iran, for hosting this meeting and for its kind hospitality. I hope that you will have some time at least to enjoy the magnificent beauty and charm of this country and the warmth of its people. I wish you good luck in your endeavour.

Annex 5

ADDRESS BY THE MINISTER OF HEALTH AND MEDICAL EDUCATION, ISLAMIC REPUBLIC OF IRAN

Ladies and Gentlemen

In the past few decades, science has advanced so rapidly that it would be difficult to predict the new achievements. Scientists in the world are perusing research with care and precision and there is no doubt that in most cases the results will become available to the public and thus increasing public health awareness. Among sciences that have become more focus of attention and have caused great impacts are information technology and biotechnology. New biotechnology is emerged by our ability to manipulate genes and scientists' ability to change and manipulate genes in living organisms. This increased our ability to make recombinant proteins in unbelievable scales which could have never been done by conventional or classical approaches. Insulin was produced in the 1980s using genetic engineering and it was the beginning of new series of recombinant proteins. In later years, several proteins and vaccines were produced the same way. Recombinant technology enabled us to add, delete or change genes in several living organisms including cells, plants and mammals. Today we can produce recombinant proteins in animal milk like in goats or cows. Producing plants with special abilities like resistance to insects has enabled us to produce better and more products. Producing recombinant vaccines have made them safe and yet effective.

Technology in performing genetic engineering in the medical field has not just enabled us to produce recombinant drugs but has also enabled us to find genes for diseases like B-thalassaemia, sickle cell disease, haemophilia and many more. This in turn has enabled us to prevent new cases.

Prenatal diagnosis has become available to the families for decades. In the 1980s, the creation and patenting of the PCR technique resulted in earning billions of dollars by reselling the license for using this technique. It has changed the views of scientists, companies and policy makers. Gradually private and public companies and institutions started to patent almost everything they find. This caused the acceleration of research and the eagerness of trying to find, discover, and invent new things. Small companies grew bigger and bigger, some of which were either merged and/or became huge. These events have made the access of new discoveries for others less possible and more expensive. For this, the race has gained momentum and western countries are trying massively to keep the gap while and less developed countries are eager to close the gap by all means. In this regard, some countries have started programmes to make up for the lost opportunities and gain some respect like Cuba, South Korea and Singapore.

As time passes, countries possessing these technologies show more reluctance in transfer of technologies to those in need or lacking those new technologies. They are more willing to sell us their end products since they earn billions of dollars out of it.

Among the third world countries, Islamic countries have lagged behind even more. There are several reasons for this lagging and they must take urgent and well planned actions to reduce the technology gaps. If they cooperate and work together, then there will be more chance of success. I am very pleased that WHO has advocated the creation of regional genomics and biotechnology networks.

Fortunately, Islamic Republic of Iran has passed behind difficult years of war and sanctions. In the past 10 years, with the help of policy makers, scientists, institutions and politicians, Iran has gained some small yet precious achievements in the field of biotechnology and genetics.

Today, with more understanding of the importance of investing in new technologies, the government of Islamic Republic of Iran is seeking a well thought and planned programme for biotechnology and genomics after we have recently passed the National Biotechnology Document in the government. In the Ministry of Health and Medical Education, we have created three networks in Molecular Medicine, Medical Biotechnology and Herbal Medicine. We have created a High Tech Committee and Nanomedicine Committee. We would be very pleased to have a well planned programme for cooperation with other Islamic countries particularly in the EMR Region. We are pleased to host this meeting.

At the end, I would like to welcome you again and to the distinguished scientists and policy makers from countries of the Region, WHO/EMRO and WHO/HQ in addition to our Iranian participants with the best of success and health. We hope you enjoy your visit to Iran and take back pleasant memories.

As the Minister of Health, I support your decisions for the Network.

Thank you for your attention.