Health-related research institutes on genomics and biotechnology in the WHO Eastern Mediterranean Region

World Health Organization
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Contents

Abbreviations

2DEP	2 dimensional electrophoresis
Bioinfo	Bioinformatics centre
DHPLC	Denaturing high-performance liquid chromatography
DNASeq	DNA sequencer
Ferment	Fermentation
GCMass	Gas chromatography mass
Hdarry	High density array
MicArry	Micro array
NRecVac	Non-recombinant vaccine production
PCR	Polymerase chain reaction
RecDrg	Recombinant drug production
RecVac	Recombinant vaccine production
CHEF	Clamped homogeneous electrical field

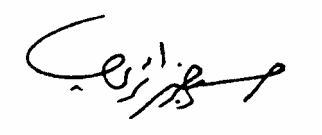
Foreword

Health research and development is an expensive undertaking. However, its long-term value, in terms of socioeconomic development and well-being of societies, is priceless. The advent of genomics now provides an opportunity for developing countries to contribute to this journey for knowledge. I believe that in our Region knowledge-based innovation is indispensable for the future development of health services, if continued health and socioeconomic gains are to be realized.

The cost of building institutions for health research is beyond the resources of most developing countries. However, despite the lack of resources genomic and biotechnological research activities have gained momentum in some countries of WHO's Eastern Mediterranean Region in recent years. Even with modest infrastructure countries can join together to optimize their limited resources for finding genomic and biotechnological solutions to combat disease and other health issues prevailing in the Region. Thus, continual assessment of the regional health research capacity in genomics and biotechnology is important to help develop guidelines for health research policy, resource sharing and identification of priorities to overcome regional health issues.

This report on health-related research institutes on genomics and biotechnology in the Eastern Mediterranean Region is an initial appraisal of the regional capacity in the field of genomics and biotechnology in health in the Member States. Based on a small sample of institutes from 11 countries of the Region it gives a glimpse of the health research activities, expertise, facilities, funding resources and training opportunities in the genomics and biotechnology institutes of the Region. A valuable contribution was made by the applicants of the EMRO-COMSTECH Grant for Research in Applied Biotechnology and Genomics in Health for Member States of the Eastern Mediterranean Region of WHO in providing all necessary data pertaining to their respective institutes. It is hoped that in due

course more information on biotechnology and genomics-related activities in the Region will be generated and harnessed, creating an ever-increasing database.



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Executive summary

There is very little published work on the facilities for health research in genomics and biotechnology in countries of the WHO Eastern Mediterranean Region. The present report on health-related research institutes on genomics and biotechnology in the Region is based on information reported by 37 institutes from 11 countries.

The study revealed that more than 80% of all institutes were involved in research on disease diagnosis while others were engaged in the production of drugs, therapeutics and vaccines with the help of modern genomic and biotechnological techniques. The results also showed that nearly 90% of the institutes had a polymerase chain reaction (PCR) facility, while a substantial number were equipped with a deoxyribonucleic acid (DNA) sequencer, 2-dimensional electrophoresis, denaturing high-performance liquid chromatography (DHPLC), bioinformatics centres and fermentation facilities.

Nearly 60% of the institutes shared their staff with others. A highly variable personnel composition was observed in regional institutes with respect to technical staff, staff with Doctorates of Philosophy (Ph.D.), Master of Philosophy (M.Phil.) degrees, Master of Science (M.Sc.) degrees and research scholars. More than 90% of the institutes reported national, and more than 50% reported international, collaboration. The collaboration between professionals from multiple health-related disciplines is fundamental to bridging the gap between the identification of genetic contributions to disease and the development of new genomics-based interventions to improve health outcomes.

A total of 35 institutes reported short-term training facilities in molecular biology and genetics, clinical techniques, genomics, disease diagnosis, biotechnology and proteomics. Ph.D. training facilities were reported for 14 institutes, while 3 reported M.Phil. and 11 reported M.Sc. programmes in various fields of biotechnology and molecular biology and genetics.

Funding resources of more than 70% of the institutes came wholly or partly from the public sector. As regards international funding resources, 27% of the institutes received financial assistance from WHO. Other resources worth mentioning included the European Union, United States Agency for International Development (USAID), National Institutes of Health (NIH, USA), Swedish International Development Cooperation Agency (Sida), World Bank, UNICEF, UNDP, World Bank, WHO Special Programme for Research and Training in Tropical Diseases (TDR), and Karolinska Institute, Sweden. Three institutes, each from Egypt, Jordan and Oman, reported their research collaboration with National Human Genome Research Institute (NIH), which is one of the major funding agencies for supporting health research and training in genetics and related sciences in developing countries.

Recent advances in genetics hold enormous promise for addressing public health issues of grave concern to countries of the Eastern Mediterranean Region. This promise however, remains to be actualized. Implementing the strategies discussed in the present study requires a larger-scale study of the health research institutional capacity in the Region as well as a new mindset, as success in employing biotechnology and genomics in health research will be measured, not by the number of scientists trained or the volume of academic publications, but rather by the ability of countries to apply global, regional and country-specific knowledge to local problems. Country-specific health research has the potential to contribute to global knowledge through innovation, adaptation and new discovery.

The opportunities before us also present some new challenges. In addition to investments in infrastructure, major investments will be required in the development of human resources. Therefore, large-scale analysis of the regional institutional capacity for biotechnology and genomics in health research will help in the establishment of networks, assessment of training needs, resolving bioethical issues and framing of priorities for applied health based on genomics and biotechnology.

Introduction

After a massive global scientific effort stretching back ten years, the full map of the human genome has finally been completed and published. The breaking of the genetic code, and the secrets it has now exposed, has already sparked a revolution in human understanding, but this is only the beginning. The human genome will change our understanding of human origins, of domestication, of migration and of development. It will teach us about the evolution and basis of racial difference. It will inform us about the genetic basis of diseases and help find means to prevent them. It will change our scientific horizons and with them the ethical and legal framework within which we operate.

The sequencing of the human genome has enormous implications for the WHO Eastern Mediterranean Region, in medicine, agriculture, law and sociology, but future achievement in these areas will depend on careful collection and analysis of the huge amount of data available in the public domain. There is little doubt that significant scientific advances will soon be made in the fight against malaria, tuberculosis, pneumonia and even human immunodeficiency virus and acquired immunodeficiency syndrome (HIV/AIDS). These advances are almost certain to be achieved as a consequence of our understanding of the human genome and will inevitably have a huge impact on people throughout the world. New light thrown on the capacity of humanity to shape its environment is another likely consequence of our new understanding. It is therefore crucial that scientists, thinkers and ordinary citizens of the Eastern Mediterranean Region are kept informed and take a full part in the genomic era.

Scanty information is available regarding institutes where genomics and biotechnology for health research in countries of the Region can be carried out [1,2,3,4]. It is essential now to build on the opportunity to develop institutional capacity in genomics and biotechnology in the Region and thus establish a solid foundation for long-term success in the field of health research.

Institutional weaknesses are one of the major reasons for poor development performance. Institutional capacity-building is therefore fundamental to effective poverty alleviation programmes, including those which strengthen health systems so that they better serve the poor. Poorly functioning institutions lead to wasted resources, inadequate infrastructure, shortages of supplies, corruption, poor quality of care, and a demotivated and insufficiently skilled workforce. This study is the first step in analysing the existing institutional capacity in genomics and biotechnology in the Region.

Promotion of regional capacity in biotechnology and genomics for health research

In 2001 the WHO Regional Office for the Eastern Mediterranean, with the support of Member States, embarked upon a renewed policy for health research and development in the Region [5]. Since then the Regional Office has been actively engaged in raising the issue of biotechnology. In 2002, the Regional Consultative Committee for the Eastern Mediterranean recommended affirmative action for the development of biotechnology and bioethics in the Region [6]. In the same year, the Eastern Mediterranean Regional Advisory Committee for Health Research (ACHR), in its twentieth session, extensively debated bioethics and biotechnology development in the Region and made strong recommendations to policy-makers in the Member States to take necessary action to develop capacities for promoting the use of genetics and biotechnology [7]. Specifically emphasized was the need to provide support for development of resources, raising awareness regarding ethical, social and legal issues among communities and stakeholders and identification of specific areas of health which may benefit from developments in biotechnology.

In 2003, a meeting of experts on genomics and public health policy was organized by the Regional Office in Muscat, Oman, in which eminent scientists, managers, policy-makers and representatives of civil society from the Region participated. The need to develop a broad regional consensus, vision and policy for genomics and biotechnology development was emphasized [8]. At that meeting, the Regional Office

and the Organization of Islamic Conference Standing Committee on Scientific and Technological Cooperation (COMSTECH) were urged to provide coordination and networking with national biotechnology bodies and to consider establishing a regional fund to support research and capacity-building in genomics and biotechnology.

In the Fiftieth Session of the Regional Committee in 2003, the Regional Office was requested to advocate for the development and application of genomics and biotechnology for health with national authorities [9]. In 2004, a consultation on establishing a regional biotechnology network was held in Tehran, in the Islamic Republic of Iran, for representatives of selected centres of excellence in health-related molecular biology, biotechnology and genomics in the Eastern Mediterranean Region [10]. In 2004, in its Fifty-first Session, the Regional Committee, having reviewed the technical paper on development and use of genomics and biotechnology for public health, recognized the potential significance and impact of genomics and biotechnology to improve health by resolution EM/RC50/R.11 [11]. Noting the establishment of the Eastern Mediterranean Health Genomics and Biotechnology Network for the promotion of greater coordination and collaboration in research and development among centres of excellence in genomics and biotechnology in the Region, the resolution urged the Member States to create a conducive environment, frame national policies, strengthen institutions, raise public awareness, and facilitate collaboration between key stakeholders for appropriate national capacity development programmes in genomics and biotechnology. The resolution also requested the Regional Office, inter alia, to foster partnerships among the main stakeholders in order to contribute to capacity-building and resource mobilization in the Region. In the same year the Regional Office and COMSTECH established a joint grant to support research in countries of the Region.

Methodology

For the present study, data were procured from two sources. The applications for the EMRO-COMSTECH grant included an information questionnaire on capacities of the applicant's institute in genomics and

biotechnology (Annex 1). Out of 63 applications received from nine countries of the Region, information on 34 institutes was provided by the applicants (Annex 2). Similar information, procured during the Eastern Mediterranean Consultation on Establishing a Regional Biotechnology Network, in 2004 [10], was also available on a few other institutes of the Region. As a result, information on 37 institutes was available from 11 regional countries. A database of this information was established for quick retrieval and analysis.

A database of the information available on all the 37 genomic and biotechnology institutes was established using MS Excel. The program's system for analysis, ToolPak and Macros, was employed for studying distribution, trends and for statistical analysis. Statistics were worked out for the following quantitative aspects of the institutes:

- focus of interest in genomics and biotechnology research and development in the institute;
- donors and funding agencies;
- faculty strength;
- training facilities in the institute;
- institutional ethics committee;
- collaborating partners in research and development;
- technical facilities for genomics and biotechnology.

Results

From 11 countries of the Region 37 institutes participated in the study (Figure 1). The Islamic Republic of Iran was represented by 16 institutes while 5 countries were represented by only 1 institute from each. Only 1 institute was purely industrial based, while 10 institutes belonged to medical or science universities of the Region (see Annex 2 for details). There was national collaboration between 34 institutes (92%) and 30 (81%) had international collaboration with other institutes, universities, and laboratories. Out of 34 institutes which specified their national funding resources, 26 (70%) were funded by more than one agency, national or international or both. Funding of 27 (73%) institutes came wholly or partly from the public sector, i.e., the ministry of health, other ministries and public sector universities (Figure 2).

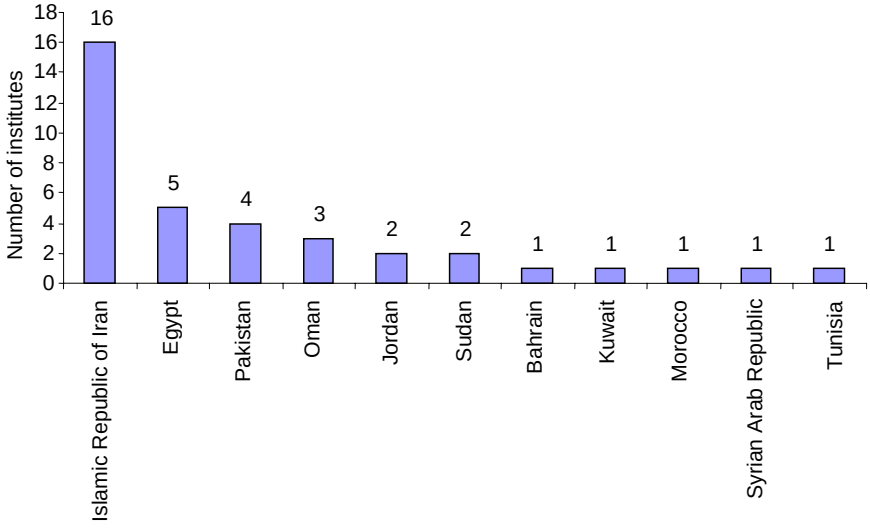

Figure 1. Information on institutional capacities on genomics and biotechnology from 11 countries of the Eastern Mediterranean Region

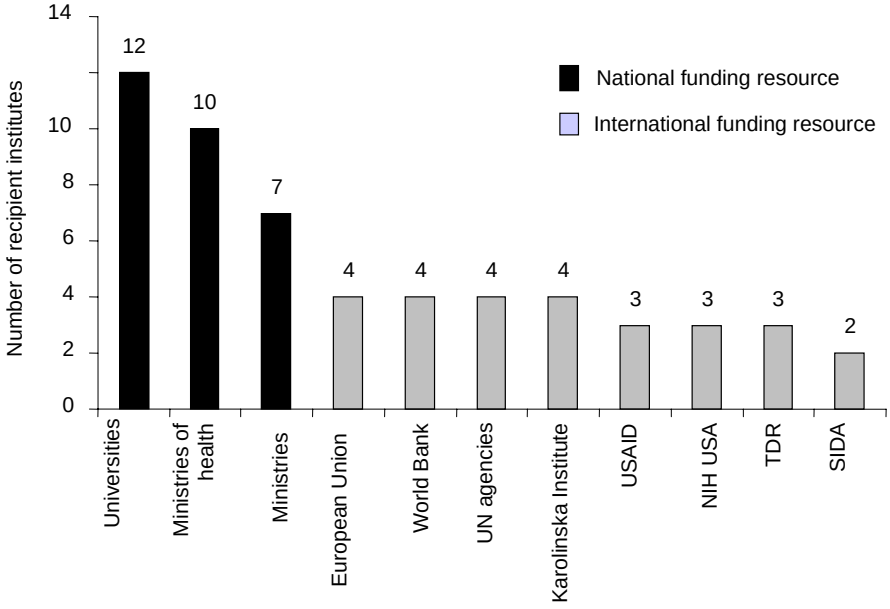

Figure 2. National and international funding resources of the genomics and biotechnology institutes

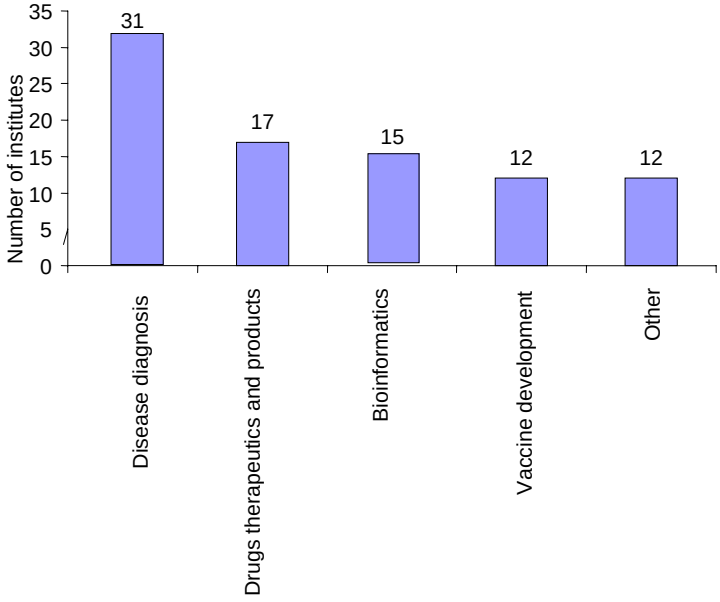

Figure 3. Focus of interest in genomics and biotechnology research and development in the Region

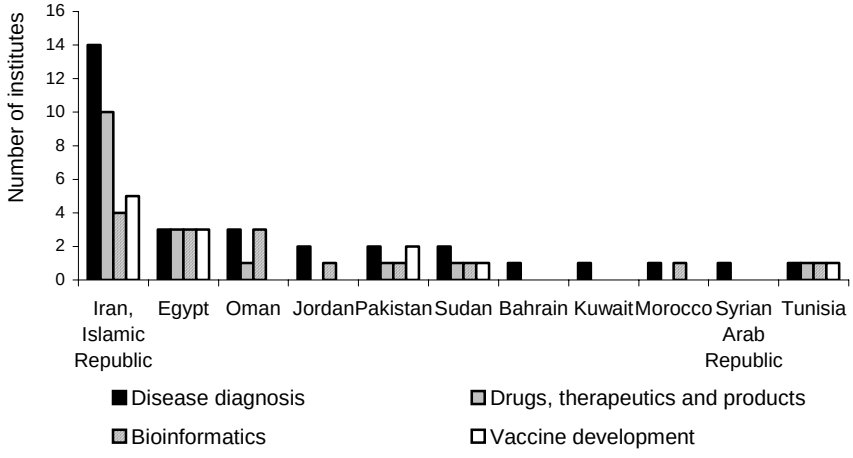

Figure 4. Focus of interest in genomics and biotechnology research and development in the institutes of regional countries

International funding resources were specified by 22 institutes and 10 (27%) received financial assistance from WHO. Other resources worth mentioning included the European Union, United States Agency for International Development (USAID), NIH USA, Sida, World Bank, TDR and Karolinska Institute, Sweden (Figure 2).

The short-term training facilities reported by 35 (95%) institutes included molecular biology/genetics, clinical techniques, genomics, disease diagnosis, biotechnology and proteomics. Concerning long-term training specified by 31 (84%) institutes, 14 (38%) had Doctor of Philosophy, 3 (8%) had Master of Philosophy, and 11 (30%) had Master of Science programmes in various fields of biotechnology and molecular biology/genetics (see Annex 2 for details).

The analysis revealed that 31 institutes (84%) were involved in research on disease diagnosis while some were engaged in activities such as production of drugs, therapeutics and vaccines (Figures 3 and 4). There was activity in bioinformatics and other related fields of biotechnology and molecular biology. The presence of an ethics committee with varying numbers of research proposals processed was reported by 25 institutes (68%).

The frequency of facilities for the technologies in the 37 institutes presently studied is shown in Figure 5. Most of the institutes had PCR facilities, while a substantial number were equipped with DNA sequencers, 2 dimensional electrophoresis, DHPLC, bioinformatics centres and fermentation facilities. However, only 60% of the institutes shared their facilities with others.

The distribution of the technical facilities in the 11 countries presently studied (Table 1) showed that Bahrain, Jordan, Kuwait, Morocco, Oman, Pakistan, Sudan and Syrian Arab Republic had a high frequency of advanced analytical facility but almost no production facilities such as recombinant drug, recombinant vaccine and non-recombinant vaccine production as well as a very low frequency of the latest technologies such as micro and high density

arrays. Egypt, Islamic Republic of Iran and Tunisia had higher frequencies of analytical as well as production facilities.

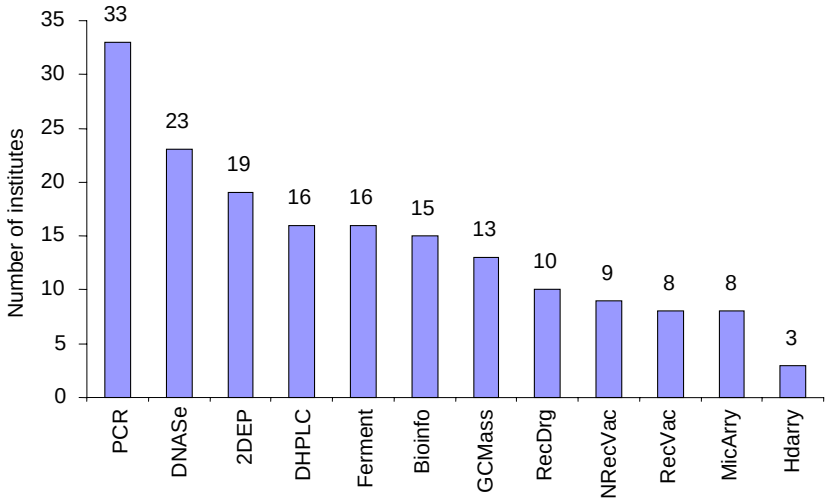

Figure 5. Genomics and biotechnology research facilities in the Region

Table 1. Distribution of genomics and biotechnology research facilities in 11 countries of the Eastern Mediterranean Region

Technical facilities	Bahrain	Egypt	Islamic Republic of Iran	Jordan	Kuwait	Morocco	Oman	Pakistan	Sudan	Syrian Arab Republic	Tunisia
PCR	1	5	13	2	1	1	3	4	1	1	1
DNASeq	1	4	7	2	1	1	2	3	1	0	1
2DEP	1	4	7	2	0	1	1	1	1	0	1
DHPLC	1	3	6	0	0	0	3	1	0	1	1
Ferment	0	3	8	1	0	0	0	3	0	0	1
Bioinfo	0	2	9	0	0	0	1	1	1	0	1
GCMass	1	2	3	2	0	0	2	3	0	0	0
RecDrg	0	2	7	0	0	0	0	0	0	0	1
RecVac	0	2	5	0	0	0	0	0	0	0	1
NRecVac	0	3	6	0	0	0	0	0	0	0	0
MicArry	0	2	4	0	1	0	0	1	0	0	0
Hdarry	0	1	1	0	0	0	0	1	0	0	0

A highly variable staff composition was observed in regional institutes with respect to technical staff with Doctors of Philosophy, Masters of Philosophy, Masters of Science and research scholars (Table 2). There were two Egyptian institutes, namely, National Research Centre, Giza, and VACSERA, with strengths of 6200 and 1300 personnel, respectively. None of the institutes from any other country was comparable with these two institutes on the basis of faculty strength. However, the Pasteur Institutes of Tunisia and the Islamic Republic of Iran were next in rank, with personnel strength of 997 and 474, respectively.

Table 2. Composition of regional research institutes as related to the number of staff

Country	Total technical staff	Staff with Ph.D.	Staff with M.Phil./ M.Sc.	Ph.D. scholars	M.Sc./ M.Phil. scholars	Institutes
Bahrain	6	2	3	1	1	1
Egypt	4069	1249	897	797	632	5
Iran, Islamic Republic of	949	392	400	130	133	16
Jordan	32	32	18	8	10	2
Kuwait	10	5	0	4	1	1
Morocco	52	23	10	8	0	1
Oman	13	10	6	4	40	3
Pakistan	34	34	64	225	3	4
Sudan	12	10	5	4	1	2
Syrian Arab Republic	3	0	3	0	0	1
Tunisia	179	725	0	45	48	1

Discussion

The present study is based on a small sample of institutes involved in genomic and biotechnological activities with special reference to health research in the Eastern Mediterranean Region. However, taking into account the overall size of the potential health research institutes in countries of the Region, as can be assessed from the number of medical institutes listed in the Regional Office online database [12], whereby most of the institutes are not research institutes, it can be safely assumed that the sample at hand is quite representative of the situation in the Region (Table 3).

Table 3. Medical institutes in countries of the Eastern Mediterranean Region

Country	Medical institutes
Afghanistan	4
Bahrain	2
Egypt	39
Iran, Islamic Republic of	29
Iraq	21
Jordan	3
Kuwait	7
Lebanon	6
Libyan Arab Jamahiriya	11
Morocco	21
Oman	8
Pakistan	26
Qatar	3
Saudi Arabia	51
Somalia	1
Sudan	9
Syrian Arab Republic	11
Tunisia	15
United Arab Emirates	3
Yemen	2

Source: [12]

More than 80% of the institutes in the present analysis showed disease diagnostic as their major focus of interest and nearly an equal proportion was equipped with sophisticated molecular diagnostic facilities, such as PCR, which are indispensable for diagnosis of several genetic disorders. It should be of significant interest to health authorities in these countries to know the causes of these diseases: in the short term, to be able to offer genetic counselling and prenatal diagnosis to families, and in the long term to find ways to ameliorate, cure, or eliminate these diseases. Moreover, these genetic resources have the potential to make major contributions to the study of diseases that are of worldwide significance, underlining the importance of carrying out research in this region of the world [13].

The appropriate level at which countries should begin to engage in biotechnology and genomic sciences will vary widely among the countries of the Eastern Mediterranean Region, a subject that has engendered active debate as far as development of these areas in developing countries is concerned [14]. The WHO Report on Genomics and World Health recommends that a serious cost–benefit analysis is undertaken and the value of such an investment weighed against all the competing health needs of each country [4]. Training a small core of scientists in genetic epidemiology and gene mapping to help better understanding of diseases within their own populations will serve national interests at a modest cost.

Sequencing and other genomic practices require expensive equipment that is continually being modified as technology matures. In the present study nearly 60% of institutes reported having a DNA sequencer. Unfortunately, even the newest genomic technologies may soon become obsolete. In addition, a recent survey reported in Nature showed that poor countries have to pay up to 70% more than other countries for identical scientific supplies [15]. Therefore, countries with limited resources should collaborate and outsource until the technologies stabilize, and should meanwhile invest in better computers, broadband access and software to allow for efficient data analysis, bioinformatics and data mining [14].

More than 90% of the institutes in the present study reported national collaboration. The collaboration between professionals from multiple health-related disciplines will be fundamental to bridging the gap between the identification of genetic contributions to disease and the development of new genomics-based interventions to improve health outcomes. In many instances, populations in countries of the Region have specific advantages in carrying out genetics research, particularly for common disorders, including cardiovascular disease, cancer and mental illness, which are leading causes of morbidity and even mortality worldwide [16,17]. It is likely that small variations in several unidentified genes make significant contributions to the onset and expression of these common disorders, which are further influenced by environmental and behavioural risk factors. However, there are disorders that are specifically prevalent among the Arab ethnic group, either uniformly or in certain locations [18]. The Arab genetic diseases include Bardet-Biedl syndrome, Meckel syndrome, autosomal recessive severe childhood muscular dystrophy, osteopetrosis and renal tubular acidosis, Sanjad-Sakati syndrome and others. In all populations of the Region, marriages between close relatives are common, leading to a high rate of genetically-influenced diseases that may be rare in other regions [14]. Armed with the new tools of genomic analysis, geneticists of the Region can gain footholds against many of these diseases by careful analysis of these special populations.

While the benefits of genomic and biotechnological technologies are clearly relevant to all countries of the Region, not all countries have the infrastructure and resources necessary to support new, emerging and expensive technologies. For those countries that do, and are willing to make this commitment at the highest level, the potential rewards, both for economic activities and for relevant health outcomes, are very promising.

There are two major obstacles to full participation in genomic research in the Region that can be assessed from the present study: the first is a lack of financial capital, and the second is a dearth of well-qualified, trained personnel. This is apparent with the funding

resources of more than 70% of all institutes coming wholly or partly from the public sector, which is likely to represent only a small fraction of the total health budget of countries of the Region, as has been reported in several international forums [19]. Although science and technology is seldom viewed as a high-priority strategic sector by developing countries, some governments have recognized the potential health, social and economic benefits of investing in the genetic sciences during this critical window of opportunity. China, for example, was the only developing country to participate in the Human Genome Project. The establishment of the Beijing Genomics Institute and the Chinese National Human Genome Center not only allowed a Chinese contribution to the physical sequencing of the human genome, but also created the capacity for Chinese researchers to fully engage in a range of genomics research [14].

It is clear that recent advances in genomics and biotechnology hold enormous promise for addressing public health issues of grave concern to countries of the Region. That promise, however, remains to be actualized. It is not a simple problem to weigh when and at what level a country that is poor in resources and facing severe shortages of personnel and infrastructure should invest in capacity-building. Nonetheless, these countries have much to contribute and there are many ways to enable genetic sciences. Within 5 to 10 years, many developing countries will have entered the epidemiological transition and will face increasing public health crises of the common chronic, noncommunicable diseases, in addition to carrying a burden of infectious disease [20,21]. To prepare for that transition, development of scientific capacity in genomics and bioinformatics, at levels appropriate to the needs and resources of each country, must begin without delay.

How can poorer nations get more access to genomics for development? Much genomics knowledge has been made public, so it can be considered a global public good, although private companies make use of this information to develop products and services [3]. Countries of the Region need a governance mechanism that fosters a balance between the global-public-good characteristics

of genomics knowledge and the private-good nature of its application.

The major ethical, legal and social issues that have arisen in the context of developments in genomics and health in developed countries are also of relevance to countries of the Region. In the present study 67% of all institutes reported the presence of an ethics committee. The question before the Region today is what role it can play vis-à-vis these issues. Ethical issues raised by genomic and biotechnological research include privacy, community benefits, informed consent, gene ownership and expropriation, stigmatization and intellectual property, among others. Each country, with its own culture and history, will approach these issues in unique ways. In order to carry out international collaborative genetics research, it is necessary to both understand and participate in building international consensus on how to involve individuals and communities in research, while also respecting culture-specific sensitivities and solutions. Consequently, an equally critical aspect of each programme is training in the ethical, legal and social implications of genetics and genomics research within the cultural context of the participating countries.

The Eastern Mediterranean Advisory Committee on Health Research, in its twentieth session, inter alia, strongly recommended establishing a regional advisory committee on genomic research and biotechnology [7]. Such a committee would be requested to focus on providing advocacy, technical guidance and advice on priority-needs, applications, training, building linkages and resource mobilization, as well as to advise on ethical, social and legal issues to the Regional Office and Member States, to develop research and development in genomics and biotechnology. At the same time, the Member States were urged to provide, inter alia, necessary support for development of human, financial and material resources in molecular biology, biotechnology and genetic research and to develop country and intercountry research networking in biogenetics. As a follow-up of these recommendations, the Regional Office undertook such initiatives as organizing a consultation on establishing a regional

biotechnology network for representatives of selected centres of excellence (health-related) in molecular biology, biotechnology and genomics [10], and establishing the EMRO-COMSTECH grant to support research in biotechnology and genomics for solving health-related problems in countries of the Region. All these efforts help in strengthening the existing infrastructure but the issues and challenges for countries in the Region remain immense. Countries need to build appropriate capacity in genomics and biotechnology, such as micro array analysis and bioinformatics. Development of national and regional networks and partnerships to share information, resources and skills can greatly help in complementing existing tools and methodologies within resource constraints and confines [2].

Conclusion

Genomics and biotechnology provide an opportunity to understand and modify biological functions and products to an extent never previously possible. The opportunities before us also present some new challenges. In addition to investments in infrastructure, major investments will be required in the development of human resources. The new technologies also present a new set of ethical, social and legal issues that require serious study by the social science community. Therefore, large-scale analysis of the regional institutional capacity for biotechnology and genomics in health research will help in the establishment of networks, assessment of training needs, resolving bioethical issues and framing of priorities for applied health research involving genomics and biotechnology. In order to make visible these strategies a regional website, depicting infrastructure, manpower, human resources, financial resources, research opportunities and ethical issues, will keep regional researchers, institutes and governments up to date, and will serve as an effective tool in the promotion of health research in general and research in biotechnology and genomics in particular.

Implementing the strategies discussed in this study requires a new mindset, as success in employing biotechnology and genomics in

health research will be measured not by the number of scientists trained, nor the volume of academic publications, but rather by the ability of countries to apply global, regional and country-specific knowledge to local problems. Above all, country-specific health research has the potential of contributing to global knowledge through innovation adaptation and new discovery.

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Annex 1

Information questionnaire on institutional capacities on genomics and biotechnology

NOTE:

Please note that the purpose of obtaining this information is to ascertain the facilities in your centre/institute and to what degree your institute would be willing to lend support to other institutes/centres whether national or regional. **This information will not be confidential and you may choose not to respond to any of the sections in this form if you deem appropriate**. Please use the extra page if you wish to provide any further information. Also please indicate how you envision sharing facilities with other partners; i.e. which areas, what facilities etc.

1. Country:

2. Name of institution:

3. Address:

Telephone:
Facsimile:
Email:
4. Name of the head/director:

5. Focus of interest in genomics and biotechnology research and development in the institute:
Please put x where applicable

Disease diagnostics	⬭
Drugs, therapeutics and products	⬭
Vaccine development	⬭
Bioinformatics	⬭
Others (specify).	⬭

Main (key) genomics and biotechnology research and development area of the institute:

6. List of collaborating partners in research and development
National:

International:

7. List of donors/funding agencies
National:

International:

8. Faculty strength
Total technical staff(#)
Staff with Ph.D.(#)
Staff with M.Phil./M.Sc.
Staff currently undergoing Ph.D. programmes
Staff currently undergoing M.Sc./M.Phil. programmes

9. Training facilities in the institute
Please specify kind/type and duration

Short term:

Long term:

10. Institutional ethics committee

Does the institute have an ethical review committee (ERC)?

Yes/No

(Please encircle)

If no, please indicate source/mechanism for ERC support:

If yes, please indicate (during 2003) the number of research proposals

a) submitted to the ERC

b) approved by the ERC

11. Technical facilities

Please add if there are other facilities you may wish to report.

Facility	Yes/No	Facility	Yes/No	Facility	Yes/No
Micro array		PCR (RNA or DNA)		Recombinant drug production	
High density array		DNA sequencer		Recombinant vaccine production	
2 dimensional electrophoresis		GC Mass		Non-recombinant vaccine production	
DHPLC		Fermentation		Bioinformatics centre	

12. Does your institute share the facilities with other institutes / partners? Yes / No

Annex 2

A summary of health-related genomic and biotechnological institutes of the Eastern Mediterranean Region

Country:	**Bahrain**
Institute:	Genetic Department, Salmanya Medical Complex
Address:	P.O. Box 12, Salmanya Medical Complex, Manama
Tel.:	+973 17289490
Fax:	+973 17289496
Email:	ssrayed@batelco.com.bh
Head:	Dr Sheikh S. Ali Arrayed
Focus of interest:	1) Disease diagnostic
Key technical facilities:	1) Two dimensional electrophoresis; 2) DHPLC; 3) PCR (RNA or DNA); 4) DNA sequencer; 5) GC Mass
Training facilities	—
Short-term:	1) Clinical techniques/research; 2) Molecular biology/genetics
Country:	**Egypt**
Institute:	Ain Shams University Centre for Genetic Engineering and Biotechnology (ACGEB)
Address:	Ain Shams University, Abassya, Cairo
Tel.:	+20 26837862
Fax:	+20 24837888
Email:	wagidaanwar@yahoo.com
Head:	Professor Wagida Anwar
Focus of interest:	1) Disease diagnostic; 2) vaccine development; 3) bioinformatics
Key technical facilities:	1) Two dimensional electrophoresis; 2) DHPLC; 3) PCR (RNA or DNA); 4) DNA sequencer
Training facilities	—
Short-term:	1) Molecular biology/genetics
Country:	**Egypt**
Institute:	Genetic Engineering and Biotechnology Research Institute (GEBRI)
Address:	Protein Research Department, GEBRI, Mubarak City, New Borg EL Arab, Alexandria

Tel.:	+20 34593420
Fax:	+20 34593423
Email:	Redwan@yahoo.com
Head:	Professor Dr Medhat Saif EL Nasr
Focus of interest:	1) Drugs, therapeutics and products
Key technical facilities:	1) Two dimensional electrophoresis; 2) DHPLC; 3) PCR (RNA or DNA); 4) DNA sequencer; 5) GC Mass; 6) Fermentation; 7) Recombinant drug production; 8) Recombinant vaccine production; 9) Non-recombinant vaccine production; 10) Bioinformatics centre
Other facilities:	Structure biology; CHEF electrophoresis; Peptide synthesizer; Oligs synthesizer
Training facilities	—
Short-term:	1) Biotechnology; 2) molecular biology/genetics
Long-term:	Ph.D. and M.Sc.
Country:	**Egypt**
Institute:	Holding Company for Biological Products and Vaccines, VACSERA - The Egyptian Company for Biotech Industries – EGYTEC
Address:	51 Wezaret Al Zeraa St. Agouza, Giza
Tel.:	+20 27611111
Fax:	+20 23483187
Email:	m_abadi@vacsera.com
Head:	Dr Mohammed Ali S. Abadi
Focus of interest:	1) Drugs, therapeutics and products; 2) vaccine development; 3) bioinformatics
Key technical facilities:	1) Micro array; 2) High density array; 3) Two dimensional electrophoresis; 4) DHPLC; 5) PCR (RNA or DNA); 6) DNA sequencer; 7) GC Mass; 8) Fermentation; 9) Recombinant drug production; 10) Recombinant vaccine production; 11) Non-recombinant vaccine production; 12) Bioinformatics centre
Country:	**Egypt**
Institute:	National Hepatology and Tropical Medicine Research Institute
Address:	10 Kasr El-Eini St., Cairo 11441
Tel.:	+20 23688400

Fax:	+20 23682774
Email:	skafrawy@umbegypt.com
Head:	Professor Mohamed Abdel Hamid
Focus of interest:	1) Disease diagnostic
Key technical facilities:	1) Micro array; 2) PCR (RNA or DNA)
Training facilities	—
Short-term:	1) Clinical techniques/research
Long-term:	Ph.D. and M.Sc.
Country:	**Egypt**
Institute:	National Research Centre, Giza
Address:	Behooth St. (ex-Tahrir St.), Dokki, Giza
Tel.:	+20 23354971
Fax:	+20 23370931
Email:	yzgad@tedata.net.eg
Head:	Professor Hani El-Nazer
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) vaccine development; 4) bioinformatics
Key technical facilities:	1) Two dimensional electrophoresis; 2) PCR (RNA or DNA); 3) DNA sequencer; 4) Fermentation; 5) Non-recombinant vaccine production
Country:	**Islamic Republic of Iran**
Institute:	Bu Ali Research Institute
Address:	Immunogenetic and Tissue Culture Department, R.C. Bu-Ali-Bu-Ali Sq., Mashhad
Tel.:	+98 0512 ext:12
Fax:	+98 0512 ext:12
Email:	abbaszadegan@ams.ac.ir
Head:	Dr Mohammad R. Abbaszadegan
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) vaccine development
Key technical facilities:	1) PCR (RNA or DNA); 2) GC Mass; 3) Fermentation; 4) Recombinant drug production; 5) Recombinant vaccine production; 6) Bioinformatics centre
Training facilities	—
Short-term:	1) Molecular biology/genetics

Country:	**Islamic Republic of Iran**
Institute:	Cellular and Molecular Research Centre, Iran University of Medical Sciences
Address:	Shahid Hemat High Way, Iran University of Medical Sciences, Tehran
Tel.:	+98 218054365
Fax:	+98 218054355
Email:	cmrc@iums.ac.ir
Head:	Dr Issa Nourmohammadi
Focus of interest:	1) Disease diagnostic
Key technical facilities:	1) Micro array; 2) Two dimensional electrophoresis; 3) DHPLC; 4) PCR (RNA or DNA); 5) DNA sequencer; 6) GC Mass; 7) Fermentation; 8) Recombinant drug production
Other facilities:	Tissue processor; Tissue culture facilities, ELISA reader; H-counter; B-counter, HPTLC;GC;
Training facilities	—
Long-term:	Ph.D. and M.Phil.

Country:	**Islamic Republic of Iran**
Institute:	Centre for Disease Control, Ministry of Health and Medical Education
Address:	Centre for Disease Control, Ministry of Health and Medical Education Tehran
Tel.:	+98 218822145
Fax:	+98 218300444
Email:	samarataa@hotmail.com
Head:	Dr Poya
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) bioinformatics
Key technical facilities:	—
Other facilities:	Facilities in universities and other research centres are utilized
Training facilities	—
Long-term:	Ph.D.

Country:	**Islamic Republic of Iran**
Institute:	Child Development and Congenital Disorder Research Centre
Address:	Separ St., Jahan-E-Koodak Cross, Africa Ave., Tehran
Tel.:	+98 218793645
Fax:	+98 218779007
Email:	info@cded.ir
Head:	Dr Hossein Malekzafali Ardakani
Focus of interest:	1) Disease diagnostic
Key technical facilities:	—
Training facilities	—
Short-term:	1) Molecular biology/genetics

Country:	**Islamic Republic of Iran**
Institute:	Endocrinology and Metabolism Research Centre
Address:	Shariati Hospital, North Karagar St., 14114, Tehran
Tel.:	+98 218026902/3
Fax:	+98 218029399
Email:	emrc@ina.tums.ac.ir
Head:	Professor Bagher Larijani
Focus of interest:	1) Disease diagnostic
Key technical facilities:	1) Two dimensional electrophoresis; 2) DHPLC; 3) PCR (RNA or DNA); 4) Recombinant drug production; 5) Recombinant vaccine production; 6) Non-Recombinant vaccine production; 7) Bioinformatics centre
Training facilities	—
Short-term:	1) Disease diagnosis; 2) Clinical techniques/research
Long-term:	Ph.D. and M.Sc.

Country:	**Islamic Republic of Iran**
Institute:	Gastrointestinal and Liver Disease Research centre, Golestan University of Medical Sciences
Address:	Main offices at the west entrance of GOUMS (Anjirab), Gorgan, Golestan
Tel.:	+98 1714424540
Fax:	+98 1714424553
Email:	sh_semnani@yahoo.com

Head:	Dr Shahryar Semnani
Focus of interest:	1) Disease diagnostic
Key technical facilities:	1) Two dimensional electrophoresis; 2) PCR (RNA or DNA)
Other facilities:	ELISA Reader
Country:	**Islamic Republic of Iran**
Institute:	Iranian Blood Transfusion Organization
Address:	Hemat highway, Iranian Blood Transfusion Organization, P.O. Box 14665-1157, Tehran
Tel.:	+98 218601501/30
Fax:	+98 218601555
Email:	shsamie@ibto.ir
Head:	Dr Ali-Akbar Pourfathollah
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) bioinformatics
Key technical facilities:	1) DHPLC; 2) PCR (RNA or DNA); 3) DNA sequencer; 4) Bioinformatics centre
Training facilities	—
Short-term:	1) Disease diagnosis; 2) Molecular biology/genetics
Long-term:	M.Sc.
Country:	**Islamic Republic of Iran**
Institute:	Iranian Research Organization for Science and Technology, Biotechnology Department
Address:	Biotechnology Dep. No 71 Forsat St. Engelab Ave P.O. Box 15815/3538 Tehran 15819
Tel.:	+98 218838350
Fax:	+98 218838350
Email:	ofoghi@irost.ir
Head:	Dr Hamid Fathi
Focus of interest:	1) Drugs, therapeutics and products
Key technical facilities:	1) Micro array; 2) Two dimensional electrophoresis; 3) DHPLC; 4) PCR (RNA or DNA); 5) Fermentation; 6) Non-recombinant vaccine production; 7) Bioinformatics centre
Other facilities:	Plant tissue culture; DNA and protein electrophoresis and purification
Training facilities	—
Short-term:	1) Genomics

Country:	**Islamic Republic of Iran**
Institute:	Mazanandaran University of Medical Sciences
Address:	Department of Genetics and Biochemistry, Sari Medical Faculty, Khazar Boulevard, Sari
Tel.:	+98 1513 ext:11
Fax:	+98 1513 ext:11
Email:	hashemisoteh@yahoo.co.uk
Head:	Mr Mehdi Yonesi
Focus of interest:	1) Disease diagnostic
Key technical facilities:	1) Two dimensional electrophoresis; 2) PCR (RNA or DNA); 3) DNA sequencer
Other facilities:	Conformational Sensitive Gel Electrophoresis; Laminar flow

Country:	**Islamic Republic of Iran**
Institute:	Medical Science Faculty, Tarbiat Modarres University
Address:	Parasitology Department, Medical School, Tarbiat Modarres University, P.O. Box 14115-331, Tehran
Tel.:	+98 218011001
Fax:	+98 218013030
Email:	ghafarif@modares.ac.ir
Head:	Dr M. J. Rassaii
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) vaccine development
Key technical facilities:	1) Micro array; 2) High density array; 3) PCR (RNA or DNA); 4) DNA sequencer; 5) Recombinant drug production; 6) Recombinant vaccine production; 7) Non-recombinant vaccine production; 8) Bioinformatics centre
Training facilities	—
Short-term:	1) Genomics; 2) Disease diagnosis; 3) Molecular biology/genetics
Long-term:	Ph.D. and M.Sc.

Country:	**Islamic Republic of Iran**
Institute:	National Prenatal Diagnostic Reference Laboratory for Thalassemia, Genetic Research Centre
Address:	The Social Welfare and Rehabilitation Sciences University, Daneshjoo Blvd., Koodakyas St., Evin, Tehran 19834

Tel.:	+98 212407814
Fax:	+98 212407814
Email:	hnajm@mavara.com
Head:	Dr Hossein Najmabadi
Focus of interest:	1) Disease diagnostic
Key technical facilities:	—
Training facilities	—
Short-term:	1) Clinical techniques/research; 2) Molecular biology/ genetics
Long-term:	Ph.D. and M.Sc.
Country:	**Islamic Republic of Iran**
Institute:	National Research Centre for Genetic Engineering and Biotechnology
Address:	P.O. Box 14155-6343, Tehran
Tel.:	+98 214580396
Fax:	+98 214580399
Email:	m-sanati@nrcgeb.ac.ir
Head:	Dr Mohammad Hossein Sanati
Focus of interest:	1) Disease diagnostic; 2) Drugs, therapeutics and products
Key technical facilities:	1) PCR (RNA or DNA); 2) DNA sequencer; 3) fermentation; 4) recombinant drug production; 5) Bioinformatics centre
Training facilities	—
Long-term:	Ph.D.
Country:	**Islamic Republic of Iran**
Institute:	Pasteur Institute of Iran
Address:	69 Pasteur Ave., Tehran 13164
Tel.:	+98 216959911/20
Fax:	+98 216465132
Email:	office@institute.pasteur.ac.ir
Head:	Dr Mohammad Taghikhani
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) vaccine development; 4) bioinformatics
Key technical facilities:	1) Micro array; 2) Two dimensional electrophoresis; 3) DHPLC; 4) PCR (RNA or DNA); 5) DNA sequencer;

	6) GC Mass; 7) Fermentation; 8) Recombinant drug production; 9) Recombinant vaccine production; 10) Non-recombinant vaccine production; 11) Bioinformatics centre
Other facilities:	Flow cytometry, Electronic-microscope
Training facilities	—
Short-term:	1) Proteomics; 2) Disease diagnosis; 3) Biotechnology
Long-term:	Ph.D. and M.Phil.
Country:	**Islamic Republic of Iran**
Institute:	Razi Vaccine and Serum Research Centre
Address:	P.O. Box 11365-1558, Tehran
Tel.:	+98 2614554658
Fax:	+98 2614552194
Email:	Kiin@imamreza.net
Head:	Dr M.A. akhavizadehgan
Focus of interest:	1) Drugs, therapeutics and products; 2) vaccine development
Key technical facilities:	1) PCR (RNA or DNA); 2) Fermentation; 3) Non-recombinant vaccine production
Other facilities:	Ultra centrifuge; Freeze dryer; Gel Doc
Training facilities	—
Short-term:	1) Genomics
Country:	**Islamic Republic of Iran**
Institute:	Research Centre for Gastroenterology and Liver Diseases
Address:	7th floor, Taleghani Hospital, Yaman St., Evin, Tehran
Tel.:	+98 212417283
Fax:	+98 212402639
Email:	saniee@regld.org
Head:	Dr Mohammad Reza Zali
Focus of interest:	1) Disease diagnostic; 2) Drugs, therapeutics and products; 3) bioinformatics
Key technical facilities:	1) PCR (RNA or DNA); 2) DNA sequencer; 3) Fermentation; 4) Bioinformatics centre
Training facilities	—
Short-term:	1) Clinical techniques/research
Long-term:	Ph.D.

Country:	**Islamic Republic of Iran**
Institute:	Shaheed Beheshti University of Medical Sciences
Address:	Evin, Tehran
Tel.:	+98 2123871
Fax:	+98 212400052
Email:	webmaster@sbmu.ac.ir
Head:	Dr Habibollah Peyrovi
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) vaccine development
Key technical facilities:	1) Two dimensional electrophoresis; 2) DHPLC; 3) PCR (RNA or DNA); 4) Fermentation; 5) Recombinant drug production; 6) Recombinant vaccine production; 7) Non-recombinant vaccine production; 8) Bioinformatics centre
Other facilities:	Mutation detection; Hybridization; ELISA
Training facilities	—
Short-term:	1) Genomics; 2) Biotechnology

Country:	**Jordan**
Institute:	Department of Biotechnology and Genetic Engineering, Jordan University of Science and Technology
Address:	P.O. Box 3030, Irbid
Tel.:	+962 27201000 ext: 21111
Fax:	+962 3 ext: 12
Email:	wajih@just.edu.jo
Head:	Dr Wajih M. Owais
Focus of interest:	1) Disease diagnostic; 2) bioinformatics
Key technical facilities:	1) Two dimensional electrophoresis; 2) PCR (RNA or DNA); 3) DNA sequencer; 4) GC Mass
Training facilities	—
Short-term:	1) Genomics

Country:	**Jordan**
Institute:	Higher Council of Science and Technology
Address:	Higher Council of Science and Technology, Amman
Tel.:	+962 27201000 ext: 23674
Fax:	+962 27095010

Email:	nbashir@just.edu.jo
Head:	—
Focus of interest:	1) Disease diagnostic
Key technical facilities:	1) Two dimensional electrophoresis; 2) PCR (RNA or DNA); 3) DNA sequencer; 4) GC Mass; 5) Fermentation
Country:	**Kuwait**
Institute:	Centre for Clinical and Molecular Virology, WHO Collaborating Centre for Virus Reference and WHO Collaborating Centre for AIDS
Address:	Department of Microbiology, Faculty of Medicine, Kuwait University, Health Sciences Centre, P.O. Box 24923, Safat 13110
Tel.:	+965 5312300 ext:6560
Fax:	+965 5336719
Email:	widad@hsc.kuniv.edu.kw
Head:	Professor Widad Al-Nakib
Focus of interest:	1) Disease diagnostic
Key technical facilities:	1) Micro array; 2) PCR (RNA or DNA); 3) DNA sequencer
Training facilities	—
Short-term:	1) Clinical techniques/research; 2) Molecular biology/genetics
Long-term:	Ph.D. and M.Sc.
Country:	**Morocco**
Institute:	Pasteur Institute of Morocco
Address:	Place Louis Pasteur, 20100 Casablanca
Tel.:	+212 22434460
Fax:	+212 22260957
Email:	pasteur@pasteur.ma
Head:	Professor Mohammed Hassar
Focus of interest:	1) Disease diagnostic; 2) bioinformatics
Key technical facilities:	1) Two dimensional electrophoresis; 2) PCR (RNA or DNA); 3) DNA sequencer

Country:	**Oman**
Institute:	Genetic Unit of the Ministry of Health
Address:	P.O. Box 393, Postal code 113, Muscat
Tel.:	+968 601489
Fax:	+968 696099
Email:	dg-ha@moh.gov.om
Head:	Dr Ali Jaffer Mohammed
Focus of interest:	1) Disease diagnostic; 2) bioinformatics
Key technical facilities:	1) DHPLC; 2) PCR (RNA or DNA); 3) Bioinformatics centre

Country:	**Oman**
Institute:	Sultan Qaboos University
Address:	P.O. Box 35, Al-Khod, Muscat 123
Tel.:	+986 515113
Fax:	+968 513880
Email:	Bayoumi@squ.edu.om
Head:	Dr Saud Al-Riyami
Focus of interest:	1) Disease diagnostic; 2) bioinformatics
Key technical facilities:	1) Two dimensional electrophoresis; 2) DHPLC; 3) PCR (RNA or DNA); 4) DNA sequencer; 5) GC Mass
Training facilities	—
Long-term:	M.Sc.

Country:	**Oman**
Institute:	Sultan Qaboos University College of Medicine and Health Sciences
Address:	Department of Child health, P.O. Box 35, Al-Khoudh
Tel.:	+968 84415137
Fax:	+968 24415137
Email:	zakiya@squ.edu.om
Head:	Dr Zakia Al-Lamaki
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) bioinformatics
Key technical facilities:	1) DHPLC; 2) PCR (RNA or DNA); 3) DNA sequencer; 4) GC Mass
Training facilities	—

Short-term:	1) Clinical techniques/research
Long-term:	M.Sc.
Country:	**Pakistan**
Institute:	Dr Panjwani Centre for Molecular Medicine and Drug Research
Address:	University of Karachi, Karachi 75270
Tel.:	+92 219243232/33/37/38
Fax:	+92 219243290/91
Email:	shakilakhandwala 1@yahoo.com
Head:	Professor Dr Atta-ur-Rehman
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) vaccine development; 4) bioinformatics
Key technical facilities:	1) Two dimensional electrophoresis; 2) DHPLC; 3) PCR (RNA or DNA); 4) DNA sequencer; 5) GC Mass; 6) Fermentation; 7) Bioinformatics centre
Other facilities:	Tissue culture; 1 and 2d NMR with Cryprobe technology; flow cytometry; X-ray; beta-scintillation counter; Gamma counter
Training facilities	—
Short-term:	1) Proteomics
Long-term:	Ph.D. and M.Phil.
Country:	**Pakistan**
Institute:	International Centre for Chemical Sciences, HEG RIC
Address:	University of Karachi, Karachi 75270
Tel.:	+92 219243232/33/37/38
Fax:	+92 219243290/91
Email:	drsaif@super.net.pk
Head:	Professor Atta-ur-Rehman
Focus of interest:	—
Key technical facilities:	1) PCR (RNA or DNA); 2) GC Mass
Country:	**Pakistan**
Institute:	National Institute of Health
Address:	Islamabad
Tel.:	+92 519255117
Fax:	+92 519255099

Email:	edoffice@apollo.net.pk
Head:	Lt. Gen ® Karamat Ahamad Karamat
Focus of interest:	1) Disease diagnostic; 2) vaccine development
Key technical facilities:	1) Micro array; 2) High density array; 3) PCR (RNA or DNA); 4) DNA sequencer; 5) GC Mass; 6) Fermentation
Country:	**Pakistan**
Institute:	Postgraduate Medical Institute
Address:	Phase-IV, Peshawar
Tel.:	+92 919217190
Fax:	+92 929217190
Email:	arshadj@hotmail.com
Head:	Professor Arshad Javed
Focus of interest:	—
Key technical facilities:	1) PCR (RNA or DNA); 2) DNA sequencer; 3) Fermentation
Country:	**Sudan**
Institute:	Ahfad University for Women, Ahfad Biomedical Research Laboratory
Address:	P.O. Box 167, Omdurman
Tel.:	+249 87553363
Email:	ahfad@sudamil.net
Head:	Ms. Durria Mansour Elhussein
Focus of interest:	1) Disease diagnostic
Key technical facilities:	—
Training facilities	—
Short-term:	1) Genomics
Long-term:	Ph.D. and M.Sc.
Country:	**Sudan**
Institute:	Institute of Endemic Diseases, University of Khartoum
Address:	P.O. Box 11463, Khartoum
Tel.:	+249 912 ext:11
Fax:	+249 184 ext:11
Email:	—

Head:	Professor+D31 Maowia Mohammad Mukhtar
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) vaccine development; 4) bioinformatics
Key technical facilities:	1) Two dimensional electrophoresis; 2) PCR (RNA or DNA); 3) DNA sequencer; 4) Bioinformatics centre
Other facilities:	Tissue culture; Liquid nitrogen storage
Training facilities	—
Long-term:	Ph.D. and M.Sc.
Country:	**Syrian Arab Republic**
Institute:	Ministry of Health, PHLs/Molecular Biology Laboratory
Address:	PHLs/Damascus, Aleppo St, Alghassani, Damascus
Tel.:	+963 114 ext:11
Fax:	+963 114 ext:11
Email:	mounakh@scs.net.og
Head:	Dr Maisoun Nasri
Focus of interest:	1) Disease diagnostic
Key technical facilities:	1) DHPLC; 2) PCR (RNA or DNA)
Country:	**Tunisia**
Institute:	Pasteur Institute of Tunisia
Address:	13, Place Pasteur – BP 74, 1002, Tunis, Belvedere
Tel.:	+216 71783022/21671843755
Fax:	+216 71791833
Head:	Professor Dellagi Mohamed Koussay
Focus of interest:	1) Disease diagnostic; 2) drugs, therapeutics and products; 3) vaccine development; 4) bioinformatics
Key technical facilities:	1) Two dimensional electrophoresis; 2) DHPLC; 3) PCR (RNA or DNA); 4) DNA sequencer; 5) Fermentation; 6) Recombinant drug production; 7) Recombinant vaccine production; 8) Bioinformatics centre
Other facilities:	HPLC; Real time PCR

The sequencing of the human genome has enormous implications for the Eastern Mediterranean Region in medicine, agriculture, law and sociology. Future progress in these fields will depend upon careful collection, analysis and application of information generated through genomics and biotechnology. Based on a sample of 37 institutes from 11 countries the publication appraises regional capacity in the field of genomics and biotechnology in health by examining the focus of interest, technical facilities, training facilities and staff of institutes in the Region where research in genomics and biotechnology is being pursued. It discusses the need for countries to optimize their resources to find genomic and biotechnological solutions to combat disease and other health issues prevalent in the Region. It supplies a listing of infrastructure and expertise for quick reference by health researchers, scholars, policy-makers and other stakeholders of health services.

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