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UNIDO PROJECT

Report on Biotechnology Development in Argentina: Present  
Status and Future Potentials

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As part of a broader question on development of new engineering technology, the Centro Argentino de Ingenieros in Buenos Aires organized a week long conference (1° Congreso Sobre Nuevas Ingenierias) on new technology of which biotechnology was a part. A lively discussion on what is happening in Argentina with regard to biotechnology development, what are the problems and what opportunities lie ahead, ensued with active participation of representatives from a number of industries and the academia. The writer of the report also took part in such discussions, made presentations regarding how biotechnology is being developed in the United States and other developed countries, and finally participated in drawing recommendations regarding the participation of both academic and industrial sectors to work closely to allow meaningful development of biotechnology. In addition, the consultant visited a number of national laboratories and the University of Buenos Aires to discuss the state of biotechnology development in such institutions, the problems faced by the administrators, the faculty and the students and discussed possible avenues by which meaningful biotechnology development can take place in Argentina with some help from UNIDO/UNDP. This report summarizes the outcome of such discussions.

#### The state of biotechnology development in Argentina:

##### a. academic sector

A number of institutions in Buenos Aires, that the consultant had an opportunity to visit, are involved in biotechnological research, in particular the Instituto de Investigaciones en Ingenieria Genetica y Biologia Molecular (INGEBI), the Instituto de Investigaciones Bioquimicas (Fundacion Campomar) and the Universidad de Buenos Aires. In addition, the consultant held extensive discussions on biotechnology development with a group of faculty from the

University NAC La Plata led by Dr. Maria Teresa Paineira, who are actively engaged in work related to oil pollution control, and with Professor Adolfo Garcia Martinez of the Facultad de Quimica Industrial y Agricola de la Universidad Nacional del Litoral (U.N.L.), who is a vital force in advocating close co-operation between the industries and the University faculty. Professor Martinez has had extensive industrial experience, particularly in food technology and preservation with Monsanto and CPC in the United States, before he joined the UNL and contributed significantly to the discussions on problems and perspectives on biotechnology development during the conference. The major problems that appear to confront biotechnology development in Argentina are the lack of financial resources, a lack of availability of highly trained personnel, and a lack of maintenance and access to sophisticated equipments and biological reagents. A synopsis of the discussion the consultant had with individual scientists follows.

Prof. Adolfo Martinez feels that the slow pace of biotechnology development in Argentina is not only due to financial constraints and lack of highly trained personnel, but also an unwillingness on the part of the academic and industrial sectors to talk to each other. Having had both academic and industrial experience, he knows how important it is to have this dialogue and he feels that some avenues must be opened up to facilitate this dialogue. An identical view was also voiced by Professor Hector Norberto Torres, who is the Director of INGEBI and is also the Dean of the School of Natural and Exact sciences of the University of Buenos Aires. Professor Torres pointed out that although INGEBI has about eleven faculty with a large number of students and technical associates, the annual budget of the institute is only about \$70,000 or so. This greatly limits the availability of costly reagents and equipments, and

leads to continued deterioration in faculty moral and capability. Many students choose to leave Argentina for abroad, and a number of very good students from INGEBI have gone to various U.S. and foreign Universities and industrial research centers.

The state of affairs at the Buenos Aires University is not very bright either. The University has a long standing problem with a limited budget and desperately needs outside funding. This point was repeatedly emphasized during my meeting with Dr. Torres, Dr. David Prigollini, Vice Rector of the University and Dr. Mario Albornoz, Secretary of the Science of Technology Division of the University. INGEBI is scheduled to move to a new location at a Buenos Aires suburb in the near future and some infusion of resources at this stage will allow the institute to function quickly and with vigor. It was decided to hold some informal discussion with Mr. Luis Soto-Krebs, resident UNDP field adviser, to see if UNDP could be of help in this regard.

An entire day was spent in discussing topics of biotechnology research with individual faculty at INGEBI and the University of Buenos Aires. Dr. Alberto Kornblihtt, who joined INGEBI in 1984 after postdoctoral work at Oxford, is very active in the area of studying the mechanism of splicing using fibronectin cDNA. Another faculty, Dr. Norberto Judewicz is with INGEBI since 1981, and is active in the area of protein phosphorylation in nuclei and the organization and regulation of tyrosinase gene involved in melanin synthesis in Neurospora crassa. In addition, his group has characterized the ubiquitin gene from N. crassa, whose product, a 76 amino acid long protein, has been conserved throughout evolution. Dr. Alejandro Mentaserry, another faculty who joined in 1985 and who is changing his field from studies on the proteins of the central nervous system to plant molecular biology involving studies on a potato RNA

virus, is also not very optimistic on the conditions allowing a vigorous and intellectual environment for continuing his plant molecular biology research. Although he has been able to develop a potato protoplast system to study transcript formation, most of the plant cell culture technique must be done in Cordoba, about 500 kilometers away, which greatly limits the progress of the work. All the faculty at INGEBI complained about the lack of resources, inadequate supply of sophisticated chemicals and biological reagents, lack of access to adequate instrumentation and foreign journals and in general the lack of an intellectual environment. In spite of such inadequacies, the quality of research has been high and the level of productivity extremely encouraging, mainly because of the excellent skills and a determined effort on the part of the faculty and the students to develop a highly creative environment.

The University of Buenos Aires has also a number of highly productive faculty, even though the university laboratories suffer from the same maladies that confront the national laboratories. In the university, Professor Carmen Sanchez-Rivas is working on the cloning of the B. thuringiensis toxin gene with a view to using the toxins for eliminating mosquito larvae. Professor Sanchez-Rivas received her Ph.D. from Institut Pasteur under Professor Jacques Monod, and has been at the University of Buenos Aires from 1968 to 1975 and again from 1984 onwards. She feels that one of the major constraints in working in Argentina is a sense of isolation, apart from the usual problems of the lack of material and other resources. She feels strongly that some help from UNIDO in promoting regional meetings on specific biotechnological topics of relevance to Latin America would go a long way in fostering regional co-operation among Latin American countries. Professor Jose Luis Parade of the Department of Microbiology and Food Sciences, who is active in the construction of phage

resistant lactic acid bacteria for use in the cheese making industry has similar views, although he additionally feels that a lack of co-operation between the university and the industry is also partly responsible for a lack of industrial funding of university research.

The laboratory of Professor Beatriz Mendez is concerned on the development of genetic transfer systems in thermophilic and cellulolytic Clostridium species. This species degrades cellulosic materials such as filter papers under anaerobic conditions to produce ethanol and butanol. Another area is the development of mutagenic procedures and genetic transfer systems in Clostridium acetobutylicum. Dr. Mendez's group has made a collection of mutants from C. acetobutylicum ATCC 10132 with altered phenotypes related to the biosynthetic solvent pathway. Dr. Mendez, who spent several years at MIT on studying this problem, is highly productive and feels that collaboration with foreign laboratories such as the MIT laboratory or ICGEB laboratories at Trieste is one way to shake off the spirit of isolation in Argentina and remain intellectually current and productive.

An institute of international standing in Argentina is the Fundacion campomar, which has been led by Professor Luis Leloir until his death last December. I had a detailed discussion with Dr. Oscar Burrone and Dr. Luis Ielpi of the institute on the status of biotechnology research both at the institute and in Argentina in general. Dr. Burrone is also the executive secretary of the national program on biotechnology in the science and technology secretariat of the government of Argentina. He is a molecular biologist of international repute for his work on rotavirus and histocompatibility antigens, while Dr. Ielpi is well known for his work on the biochemistry and genetics of Xanthan gum. In addition, Dr. Marcelo Dankert in the institute is heavily involved in

studying complex bacterial exopolysaccharides and their industrial significance. The quality of research in the institute is very high and the financial problems less stringent, although the institute certainly needs improved funding to maintain its status as a first rate research institution. Many of the problems previously mentioned were also cited by researchers here as major impediments towards rapid progress of biotechnology development.

b. industrial sector

The status of biotechnology development in the industrial sector in Argentina is in its infancy. A number of antibiotic producing plants operated by corporations such as Pfeizer or Squibb have been shut down during the last few years, because of foreign competition. During my discussions with Dr. Alberto Diaz, Director, Biosidus S.A., or Mr. Carlos Chaves del Valle, General Manager, Laboratories Bago S.A., I sensed a great deal of optimism that perhaps the slow deterioration of the industrial sector in Argentina is over, and the present policies of the government will allow an resurgence of industrial activity, particularly related to biotechnology. Both Dr. Diaz and Mr. del Valle expressed a great deal of interest in procedures leading to licensing and manufacturing of vaccines, diagnostics and drugs and other pharmaceutical agents. These discussions were greatly aided by the participation of Mr. Luis Soto-Krebs, the UNDP field representative in Buenos Aires, who has a great deal of understanding of technology development and the role of policy matters in facilitating such developments. Some specific proposals were discussed in terms of how an Argentinian industry can act as a role model for manufacturing biotechnological products of regional interest so as to create markets within several countries of Latin America and how that in



turn will influence the development of similar industrial processes in other countries. Mr. Soto-Krebs can certainly play a very influential role in catalyzing such processes because of his familiarity with Latin American industries as well as his scientific understanding of biotechnology (as an old student of Professor Govind Khorana, a nobel laureate molecular biologist).

#### RECOMMENDATIONS

Argentina is a country with a unique standing in Latin America. It is a prosperous, progressive, highly livable country that has lately been suffering from an economic crisis resulting from economic policies and the loss of an industrial base and manufacturing productivity. It has a strong tradition of excellence in scientific research, having produced a number of nobel laureates in biology, yet suffering from the self indignation of not being able to catch up with the rest of the world. UNIDO may have a unique opportunity to use Argentina as model in demonstrating how the United Nations can help the developing countries acquire a degree of self reliance and technological capability, particularly among the Latin American countries. This, in my opinion, can be done in two ways. One way would be to bolster the scientific capabilities in biotechnology by helping the Argentinian scientists financially to obtain reagents/chemicals, items of equipment, expensive journals etc. This is similar to what UNIDO/UNDP has done for a number of developing countries. A crying need for Argentina in particular, and Latin American countries in general, is to alleviate the sense of isolation. These countries are large with sparse population, thereby making travel and communication difficult and expensive. It might be possible for UNIDO to arrange once or twice a year a meeting of Latin American scientists on a defined biotechnological topic, so

that scientists working in specific areas in various countries in Latin America will have an opportunity to compare notes and avoid research duplication. A second way and perhaps more relevant to the charter of UNIDO, to help Argentina develop its biotechnological capability is to catalyze the interaction between the academic and the industrial sectors. The industrial sector would be a lot more willing to fund projects in the academe if there is certain amount of coordination and supervision, as well as financial input, from UNIDO. This will assure that the quality of research in the academe is good, is relevant to the needs of the industrial sector and that new ideas are constantly generated and unworkable ideas set aside because of a continuing dialogue between the UNIDO coordination team, the industrial sector that primarily funds such activity and the academic scientists that generate ideas and do the work. Manufacturing of licensed products could be an initial step to generate funds that will sustain such activities, as well as provide employment to scientists and local people. Such activities could later be broadened to include other Latin American countries to generate good will as well as economic cooperation among them.