

*Canada - Latin America Initiative on Biotechnology and Sustainable Development*

# **CamBioTec**

## **CONSULTANCY REPORT**

**Contract IDRC-CIB of January 30th, 1996  
IDRC File: 91-0085-02**

**Presented to the International Development Research Centre (IDRC)**

**By the Canadian Institute of Biotechnology (CIB)**

**Ottawa, April 30th, 1996**



ARCHIV.  
660.098(5)  
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# ACRONYMS

## Chilean Organizations

CONAMA	Comisión Nacional del Medio Ambiente
CONICYT	Comisión Nacional de Investigación Científica y Tecnológica
CORFO	Corporación de Fomento de la Producción
EUROCHILE	Fundación Empresarial Comunidad Europea-Chile
FAO-RLAC	FAO-Oficina Regional para América Latina y el Caribe
FIA	Fundación Fondo de Investigación Agropecuaria
FONDEF	Fomento al Desarrollo Científico y Tecnológico
FONTEC	Fondo Nacional de Desarrollo Tecnológico y Productivo
INFOP	Instituto de Fomento Pesquero
INFOR	Instituto Forestal
INIA	Instituto de Investigaciones Agropecuarias
PUCCH	Pontificia Universidad Católica de Chile
RED-BIO	Red de Cooperación Técnica en Biotecnología Vegetal
SMP-TEC	Sociedad Minera Pudahuel-Tecnología S.A.
SOFOFA	Sociedad de Fomento Fabril

## Brazilian Organizations

ABRABI	Associação Brasileira de Empresas de Biotecnologia
BIO-MINAS	Fundação Bio Minas (Minas Gerais)
BIO-RIO	Fundação Bio Rio (Rio de Janeiro)
CENARGEN	Centro Nacional de Pesquisa de Recursos Genéticos e Biotecnologia
CNPq	Conselho Nacional de Desenvolvimento Científico e Tecnológico
CNPSo	Centro Nacional de Pesquisa de Soja
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária
FINEP	Financiadora de Estudos e Projetos
PROTEC	Programa de Terceirização Tecnológica
SEBRAE	Serviço Brasileiro de Apoio as Micro e Pequenas Empresas

**MISSION TO SOUTH AMERICA TO PROMOTE THE PARTICIPATION OF  
CHILE AND BRAZIL IN THE CAMBIOTEC INITIATIVE  
(April 1996)**

**1. SUMMARY**

Dr. Javier Verástegui, Consultant at CIB, prepared and performed this mission, first in Chile (April 7-13) and then in Brazil (April 14-20). As a result, the CIB was able to fulfill all the terms of reference of the contract. In general, the CamBioTec Initiative received strong support because it is seen as a tailored program arriving "just in time" to promote the sustainable development of commercial biotechnology in Chile and Brazil.

In Chile, 22 institutions were identified as key biotechnology players in R&D, government and industry. Meetings were held with top representatives of these institutions and many attended a seminar on CamBioTec presented by the consultant. Five Chilean biotech enterprises were visited ranging from large mining firms to small agricultural firms still emerging from incubators. A special visit to FAO's Regional Office for Latin America revealed many opportunities for collaboration between FAO's RedBio and CamBioTec. Several Chilean organizations have been identified as potential sources of local funding and many have expressed enthusiasm and/or willingness to fund operational costs, or specific activities of the Chilean Focal Point. The most appropriate institution to act as the Focal Point in Chile is CONICYT, with a strong support from Fundación EuroChile. Dr. Lionel Gil, member of EuroChile's board and of CONICYT's Biotechnology Committee, has been proposed as the local coordinator. A complete proposal was prepared together with Dr. Gil, and its approval by CONICYT's authorities has been assured.

In Brazil, the consultant met with a number of senior managers at EMBRAPA and CENARGEN, who agreed to co-fund and implement the focal point, with strong support from ABRABI, BIO-RIO, and possibly SEBRAE. Dr. Damares Castro Monte-Neshich, Technical Director at CENARGEN, is the most likely candidate for Coordinator. A number of key institutions were identified and meetings were held with representatives of 13 institutions in Brasilia and Rio de Janeiro. Everyone expressed a willingness or enthusiasm to participate in CamBioTec and FINEP, SEBRAE and CNPq are committed to fund either the operational costs or specific activities of the Brazilian Focal Point. In Rio de Janeiro, 7 small biotech firms were visited at the BIO-RIO incubating premises. A team of people from CENARGEN-EMBRAPA are committed to completing a proposal and hope to have it approved and sent in 2-3 weeks.

Meetings were held with the key officers managing CIDA's Technology Transfer Funds for the Southern Cone and Brazil to generate Canadian support for the participation of Chile and Brazil in CamBioTec. During the meeting in Canadian Embassy in Santiago a strong level of support was offered by André Deschenes and Ramiro Trucco to fund the operation of the Focal Point in Chile and recommended that any formal request for support include activities in Argentina. At the Canadian Embassy in Brasilia, Mr. Richard Smith offered his support to a formal funding request, provided it fulfills all CIDA's fund requirements for Brazil (which emphasize social and environmental issues).

The mission was extremely successful in generating interest from key institutions in both Brazil and Chile. IDRC should expect to receive proposals from the two potential focal point agencies before the next CamBioTec coordinators meeting.

## 2. INTRODUCTION

During the first months of 1995, after the formal approval of the CamBioTec Initiative, IDRC organized a competition process to determine which countries and institutions would be selected to participate in the Initiative. Thus, letters were addressed to institutions in 9 different Latin American countries, inviting them to submit proposals to become the Focal Point institutions for CamBioTec in the respective countries. Among them, letters were sent to Dr. José Miguel Aguilera at the Pontificia Universidad Católica de Chile, and Dr. Antonio Paes de Carvalho at Fundação BIO RIO and ABRABI in Brazil. Dr. Aguilera and Dr. Paes de Carvalho apologized for not being able to submit proposals for the following reasons:

- a) Dr. Aguilera was preparing to leave Chile for a sabbatical in England; and
- b) Dr. Paes de Carvalho considered that the CamBioTec proposed activities in the fields of policy research and socio-economic impacts were beyond the mission of BIO RIO & ABRABI, and suggested a state institution like EMBRAPA as the most suitable one in Brazil.

Thus, after evaluation of the submitted proposals, IDRC decided to start the activities of CamBioTec with 5 selected institutions in Canada, Argentina, Colombia, Cuba and Mexico. IDRC signed the first contract with the Canadian Institute of Biotechnology (March 1995), then with the Universidad Nacional Autónoma de México (May 1995), the Foro Argentino de Biotecnología (September 1995) and the Fundación TECNOS of Colombia (October 1995). The respective contract with the Centro para la Ingeniería Genética y Biotecnología of La Havana, Cuba, has not been signed yet.

The incorporation of Chile and Brazil was always seen integral to the success of CamBioTec, although the budget provided by IDRC did not allow to fund new focal points, other than the five already selected. The possibility to extend the number of countries was considered by IDRC towards the end of 1995, after preliminary talks between Charles Davis and André Deschenes (CIDA/Santiago de Chile) raised the possible funding of the operation of Chilean and Brazilian Focal Points, through the recently created CIDA's Technology Transfer Funds for the Southern Cone and Brazil. Consequently, on February 15th, 1996, IDRC-Montevideo contracted the CIB to perform a consultancy mission with the following terms of reference:

- a) Visit industrial, policy and research groups in biotechnology in Brazil and Chile.
- b) In Brazil, develop, in collaboration with Brazilian institutions, a proposal for Brazilian participation in the CamBioTec project.
- c) In Chile, identify possible national focal points in a CamBioTec Initiative and work with them to develop, as far as possible, a Chilean proposal to join CamBioTec.
- d) Visit CIDA officials in Chile and Brazil to brief them on CamBioTec and identify possible sources of support for national participation in CamBioTec.
- e) Submit a detailed and satisfactory report of the work accomplished to Dr. Charles Davis by April 30, 1996.

Thus, the CIB has hired Dr. Javier Verástegui as a consultant to perform this mission. Dr. Verástegui organized and coordinated the mission during February and March 1996, and performed the mission in Chile and Brazil from April 06 to 20, 1996. The activities are described per each country, according to these terms of reference.

### 3. ACTIVITIES IN CHILE

Dr. José Luis Solleiro and Dr. Bill Edwardson suggested the name of Dr. Lionel Gil Hormazábal, an internationally recognized scientist in the field of environmental toxicology, to coordinate the mission in Chile. Intensive coordination proceeded smoothly from January to March 1996. According to CIB's instructions, Dr. Gil and his collaborators at Universidad de Chile (Mr. Carlos Irrarrazabal, M.Sc., researcher, and Ms. Ximena Toro, secretary) prepared an excellent schedule of activities which was 100% completed and even extended. Among the extended activities, the consultant was able to meet representatives of FONTEC (a financial branch of CORFO) and INFOR. The schedule included a CamBioTec Seminar and meetings with financial institutions (CIDA and Chilean ones), besides those representing R&D, government and industry. Meetings with key representatives of the potential focal points and financial institutions were strategically scheduled during the first day. Dr. Gil accompanied the consultant to most of these meetings. The schedule of activities and the references of people contacted in Chile are shown in Annexes 1 and 2, respectively. The activities performed by the consultant in Chile are summarized below.

#### **Sunday, April 07**

5:30 am           Arrival at Santiago Airport

#### **Monday, April 08**

9:00 am           Meeting with Mr. Aníbal Mege, SOFOFA

Sociedad de Fomento Fabril (SOFOFA) is the most powerful industrial association in Chile, representing both large and SME industrial firms. Mr. Mege, Manager of the Environment Department, offered specific collaboration to the future activities of CamBioTec in Chile, like the promotion and co-organization of business missions of Chilean entrepreneurs to Canada, e.g. to ABIC'96 in Saskatoon (June 11-14, 1996). At his request, the CIB has sent him 10 pamphlets of this event. Mr. Mege also offered SOFOFA's sponsorship to the workshop "Environmental Biotechnologies" (October 1996, Santiago), an Environment Canada initiative funded by IEMI, which is being prepared with the collaboration of the CIB, Dr. Gil and CONAMA (Chile).

10:30 am          Meeting with the Board of Fundación EuroChile

The meeting was attended by Dr. Rafael Vicuña (President), Mr. Carl-Heinz Becks (Executive Director), Dr. Gonzalo Arenas (Executive Deputy Director) and Dr. Marcelo Montesinos (Projects Manager) from Fundación EuroChile, which is a private, non for profit organization created in 1993 by the Chilean government and the European Union to strengthen promote technology transfer and business opportunities among Chilean and European firms. EuroChile has selected biotechnology as one of its main areas of work. Among its activities, EuroChile is currently matching offers and requests, organizing round tables, and brokering joint venture agreements around 60 specific project profiles they have developed in the biotechnology area. EuroChile has established that they are not limited to promoting linkages between Europe and Chile, but that they are also interested to extend its activities to other American countries. The board expressed EuroChile's interest to become directly involved in the CamBioTec activities in Chile, together with CONICYT and Dr. Gil, offering to share their infrastructure as a contribution to the operation of the local point (they have strong limitations for cash contributions).

During the rest of the week, several meetings were held with Dr. Arenas and Dr. Montesinos to discuss the activities and budget of the preliminary proposal.

**3:00 pm Meeting with Dr. Margarita D'Etigny, FIA - Min. Agriculture**

Dr. Margarita D'Etigny is the Executive Secretary of Fundación Fondo de Investigación Agropecuaria (FIA), and is also the President of Consejo de Innovación Agraria (CIA). The former is a R&D funding agency in agriculture and the latter is a policy assessment board in agricultural innovation (including industry representatives), both linked to the Ministry of Agriculture. FIA and CIA are developing many projects/initiatives in the area of biotechnology, among them there is a diagnostics study of Chile's agricultural biotechnology (co-funded by FAO). She also mentioned a general cooperation agreement on agricultural innovation signed between the Chile's Ministry of Agriculture and Agriculture&Agri-Food Canada. She expressed enthusiasm to collaborate with CamBioTec activities in Chile. In particular, Dr. D'Etigny promised to consider the organization of a Chilean business mission to ABIC'96. At her request, the CIB has sent her 10 pamphlets of this event; coordination for this mission are ongoing.

**3:45 pm Meeting with Dr. Enrique D'Etigny, President of CONICYT**

The Comisión Nacional de Investigación Científica y Tecnológica (CONICYT) was created in 1967 as the primary S&T governmental agency charged to: promote the development of S&T research, support the development of human resources, promote the use of information systems, and network Chilean researchers with their homologues around the world. Dr. D'Etigny was very supportive of the concept of a CamBioTec focal point in Chile. He suggested three different possibilities for CONICYT to co-finance the activities of the national focal point: (a) FONDEF projects, (b) FONDECYT projects, and (c) national counterpart for international cooperation programs. These options were later discussed with CONICYT's National Committee of Biotechnology.

**4:15 pm Meeting with the National Committee of Biotechnology, CONICYT**

The Committee was established in 1983 to promote the sustainable development of biotechnology in Chile, including the task of channeling international and regional contacts and projects. The meeting was attended by Dr. Jorge Allende (President), Dr. Ximena Gomez de la Torre (Executive Secretary) and Dr. Lionel Gil (member of the committee), who all expressed full support for the creation of a CamBioTec focal point in Chile. The participation of CONICYT as the formal focal point was discussed and accepted in principle, resulting in the production of a preliminary proposal later that week (Thursday). In particular, CONICYT would contribute with its computerized database and infrastructure (office, secretarial support, etc). The co-funding options suggested by Dr. Enrique D'Etigny remained open at this time.

**4:45 pm Meeting with Dr. Jorge Yutronic, Executive Director of FONDEF**

The Fondo de Fomento al Desarrollo Científico y Tecnológico del Gobierno de Chile (FONDEF), is the CONICYT fund for S&T oriented to increase national competitiveness in socio-economic sectors of priority by promoting technology transfer and links between R&D and the industrial sector. In the period 1991-96, FONDEF supported 99 innovations with a total amount of US\$60 million. Dr. Yutronic was supportive of CamBioTec in Chile, and will consider funding specific activities of CamBioTec, provided they involve enterprises and fulfill FONDEF guidelines and priorities. The best possibility to get operational funds for the local focal point is through the international cooperation counterpart fund managed by CONICYT. A less likely possibility to co-fund this operation would be through a special FONDEF project networking the main R&D institutions (U.Chile, PUCCH, U.Concepción, U.Talca) to promote transferring and joint-venturing of their biotechnology innovations. Finally, Dr. Yutronic suggested contacting FONTEC (CORFO), another fund that seems to be more appropriate for the activities of the Chilean focal point of CamBioTec, especially the organization of Chilean business missions to Canada in specific sub-sectors.

**Tuesday, April 09**

**9:00 am            CamBioTec Seminar "Biotecnología para el Cambio", EuroChile**

This seminar was organized by the CIB in close coordination with Dr. Gil, in order to present CamBioTec to, and discuss the implementation of, a local focal point with selected representatives of key players of biotechnology in Chile. The seminar was sponsored by CONICYT and EuroChile (invitation letters were sent from Bill Edwardson, IDRC-Ottawa), and it was held at EuroChile's auditorium. Total attendance was 22 invitees representing R&D institutions, government agencies and funds, firms, business associations and CIDA (Santiago). The agriculture, veterinary, aquaculture, forestry, environment and mining sectors were all represented (see list in Annex 1). Dr. Carl Heinz-Beck introduced the consultant, who made a 40-minute presentation (using overheads) about the bioindustry in Canada, IDRC's involvement in biotechnology, and CamBioTec's origins, mission, goals, current and future activities/developments. All representatives expressed their enthusiastic willingness to participate in CamBioTec, as it was seen as the right program arriving just in time for the needs of Chilean biotechnology. The INIA representative even proposed that his institution become the focal point. An interesting discussion followed which led to the need to establish a CamBioTec Executive Committee (or network) in Chile, gathering representatives of the sectorial institutions willing to participate in the activities of the focal point. Finally, it was agreed that: (a) CONICYT should coordinate a Chilean proposal to IDRC; (b) EuroChile would collect summarized information from each institution willing to participate, in order to include them in the preliminary proposal; and (c) the consultant and CONICYT would organize another meeting at the end of the week to discuss the preliminary proposal.

**11:30 am            Meeting with Mr. André Deschenes and Dr. Ramiro Trucco, CIDA**

This meeting was held at the Canadian Embassy in Santiago immediately following the CamBioTec Seminar at EuroChile, which was attended by Dr. Ramiro Trucco. Mr. Deschenes did not require further explanation about CamBioTec and offered full support to fund a proposal to extend CamBioTec operations to Chile, through CIDA's Technology Transfer Fund for the Southern Cone. As this fund also includes Argentina, Paraguay and Uruguay, Mr. Deschenes suggested the inclusion of some activities in Argentina within the proposal to CIDA, as well as the necessary expenditures in Canada. Thus, this implies that IDRC must work out a tailored proposal fulfilling the guidelines and budgeting limitations of CIDA's fund. Mr. Deschenes also mentioned a joint proposal presented by CMA (the Canadian Manufacturing Association) and SOFOFA (Chile) to promote joint ventures, technology transfer and adaptation in the forestry sector. This should be taken into account for the IDRC-CamBioTec proposal. Mr. Deschenes mentioned that he will be reassigned in June 1996 and moving to Lima to manage the Peru-Canada Counterpart Fund; Dr. Ramiro Trucco will take over his duties at the T. T. Fund in Santiago.

**2:00 pm            Working Session at Universidad de Chile**

Dr. Lionel Gil and the consultant worked together at Dr. Gil's laboratory to develop the outline of the Chilean proposal and to identify of the most appropriate and feasible activities to be undertaken by the focal point during a 2-year period, which is the remaining time for the pilot phase of the CamBioTec Initiative. As well, Carlos Irrazábal received instructions to gather and introduce general information about the Chilean economy, S&T status and biotechnology status. Finally, Ximena Toro received instructions to introduce general information from the institutions that participated in the Seminar (gathered by EuroChile, CONICYT and Lionel Gil). The consultant also had the opportunity to visit Dr. Gil's Laboratory of Biochemistry and Environmental Toxicology at the Department of Biochemistry, Faculty of Medicine, where he leads a research group (3 PhD and 1 MSc students) studying: (a) the role of the cytochrome P-450 mono-oxygenases system in the biotransformation of xenobiotics (activation



mechanisms of pre-carcinogenic to carcinogenic compounds); and (b) the air pollution in Santiago (toxicity, chemical composition of particulate matter, evaluation of health hazards).

### Wednesday, April 10

#### 9:15 am Visit to INIA - La Platina

La Platina is one of the experimental stations of Instituto de Investigaciones Agropecuarias (INIA), which develops agricultural R&D and promotes technology transfer to the farmers in Chile. La Platina works in the central regions of Chile (regions V, VI and Metropolitan), which contributes up to 58% of the agricultural GDP. A meeting was held with three senior managers: Dr. Eduardo Besoain (Director), Dr. Antonio Hargreaves (Research Director) and Dr. Carlos Muñoz Shick (Coordinator, Vegetal Biotechnology). Dr. Muñoz, who attended the Seminar, summarized the work INIA is currently doing in several areas: agrochemicals contamination, tissue culture and micropropagation, genetic resources bank (with JICA/BID funds), biological control, true potato seeds by clonation (in collaboration with CIP-Lima), technical information, technology transfer, and agreements with agri-food firms. According to a recent diagnostics study on agro-forestry biotechnology in Chile, 80% of the research is oriented to tissue culture. Dr. Muñoz expressed his willingness to help with the organization of a Chilean potential mission of entrepreneurs to attend ABIC'96, working together with FIA, SOFOFA, SNA and Dr. Gil. Furthermore, he insisted that INIA could be the Chilean focal point. However, the visit to the laboratories did not show too much activity in biotechnology (micropropagation), and almost no activity in modern biotechnology. Apparently, INIA has suffered a reduction in funds and staff, thus many labs remained inactive or inaccessible. Things may change in the near future when a new modern biotech laboratory (now under construction) is completed, equipped and staffed. Finally, the library seems to be very active and is well connected to international networks.

#### 11:30 am Visit to Dr. Ricardo San Martín, PUCCH

We visited Dr. San Martín at the Department of Chemical Engineering, Pontificia Universidad Católica de Chile (PUCCH) to learn about his experience as a researcher-entrepreneur in the area of natural products, using the technology incubator recently put in place by PUCCH. As a FONDEF project leader (US\$1.5 million), Ricardo's research team has developed the technology and has set up a fermentation pilot plant to produce a fungus which is a natural biopesticide against *vinus Botryties*, the main pest attacking vineyards. He is currently looking for venture capital to commercialize the production of the fungus, and he is very interested to contact potential partners in Canada (will send profile to CIB). As an entrepreneur, Ricardo owns Natural Response S.A., a firm who has signed a joint-venture agreement with DITUC S.A., a private firm dependent on the Faculty of Engineering of PUCCH. The agreement allows Ricardo to use land and services adjacent to the department, and to install a small plant to obtain natural extracts for exportation like saponines from *quillay*, a foaming agent which is being exported to US, Japan and Europe. Natural Response S.A. is currently developing a blue colorant from spirulina, and a mobile essential oils pilot-plant (together with Fundación Chile). He is also planning to develop animal vaccines from spirulina, for what he would need potential partners in Canada. It appears that DITUC S.A.-PUCCH is taking a leading role in promoting innovation from Chilean R&D university results.

#### 2:30 pm Visit to BIOS-CHILE Ingeniería Genética S.A.

We met Dr. Arturo Yudelevich, R&D Manager. BIOS-Chile is a Chilean biotech firm working on R&D, manufacturing and marketing of modern bioproducts in the human and animal health fields. In 1990, BIOS Chile entered into a strategic alliance with Chiron Corp. by selling 20% of its shares. BIOS Chile product line include diagnostic kits for early detection of pregnancy (Fertitest, Detector, Confidelle, Confidelle Plus, Elisa hCG), blood screening reagents and blood tests (monoclonal antibodies, Coombs serum, Elisa for Chagas disease), and other microbiological tests and culture media. BIOS Chile has

recently acquired Laboratorios PRATER, to manufacture Chiron's bioproducts (Proleukin, Cardioxane and others). It has also created AUSTRAL Biologicals in the US, in order to deal with USDA regulations for BIOS Chile imports of monoclonal antibodies, recombinant proteins (bacteria & yeast). Furthermore, the firm has started a comprehensive R&D program to develop diagnostic kits and vaccines for salmon farms. Currently, they are completing construction of a molecular diagnostics lab to provide sophisticated services like branch DNA virus, PCR to detect viral pathogens, and tests to determine paternity. As well, they are developing another branch, BIOS Chile-Ingeniería Ambiental, to deal with pollution toxicology services. Much more projects would be shaped from this creative bioindustry in the future: diagnostic kits for plant pathogens, Fundación "Ciencia para la Vida" (a non-for profit R&D biotech fund), etc. Dr. Yudelevich attended the Seminar and expressed his willingness to collaborate with CamBioTec activities in Chile.

**4:30 pm Visit to Dr. Loreto Holuigui, Coordinator Red Bio - Chile**

The visit was canceled because Dr. Holuigui was sick at home. A phone conversation was not possible.

**5:00 pm Working Session at Universidad de Chile**

The consultant and Dr. Gil continued the preparation of the proposal, and completed the Activity Plan and the Budget, for discussion with EuroChile and CONICYT.

**8:00 pm Working Dinner with EuroChile**

The consultant and Dr. Gil met Dr. Arenas and Dr. Montesinos, Deputy Director and Projects Manager of EuroChile, respectively. The proposed activity plan for the focal point, and the proposed budget contribution from EuroChile (Can\$62,500) was discussed and accepted. Furthermore, a direct collaboration between EuroChile and CIB was discussed in the areas of identification of potential partners for Chilean innovations, a market study on aquaculture biotechnology in Chile (to be funded by Industry Canada), EXPOPESCA, and other issues.

**Thursday, April 11**

**9:00 am Meeting with Mr. Leonel Sierralta, CONAMA**

The Comisión Nacional del Medio Ambiente (CONAMA) is the top Chilean agency responsible to advise the government about environmental issues; to recommend sound environmental policies; to administer the national Environmental Impact Assessment system; to formulate quality and quality control regulations; among others. CONAMA has recently signed a Memorandum of Understandings with Environment Canada to promote cooperation on environmental issues. We met Mr. Lionel Sierralta who is Advisor to CONAMA's Executive Director, because Dr. Carlos Piña, Director of International Affairs, was traveling. Mr. Sierralta was willing to collaborate with CamBioTec and will assign a contact person for regular coordination. In particular he offered access to CONAMA's Environmental Information National System, and to co-organize the workshop on Management of Environmental Biotechnology together with Environment Canada and the CIB, tentatively scheduled for November 1996 (coordination CIB-CONAMA are now ongoing).

**11:00 am Ceremony of CONICYT's Anniversary, Centro Portales**

The consultant attended this ceremony by invitation of Dr. Enrique D'Etigny. This was a good opportunity to renew contacts with Dr. Enrique D'Etigny, Dr. Jorge Allende and Dr. Ximena Gomez from CONICYT, and to meet other Chilean biotech researchers.

**2:00 pm Meeting with Mr. Christian González, FONTEC**

The Fondo Nacional de Desarrollo Tecnológico Productivo (FONTEC) is a branch of Corporación de Fomento de la Producción (CORFO). FONTEC's mission is to promote, finance and sponsor projects on technological innovation, technology transfer, acquisition of key technological infrastructure, and to support the scale up of innovations developed by the industrial sector firms. A specific funding line of FONTEC deals with technology transfer projects presented by association of firms, like the organization of business missions to acquire technologies in a specific sub-sector, among other possibilities which open collaboration with CamBioTec. From 1991 to 95, FONTEC has funded 17 biotechnology projects for a total amount of US\$919,000. These projects range from the development of diagnostic tests for Chagas disease (to BIOS Chile), to biocontrol to fight radiata pine bugs. We met Mr. Christian González, Projects Manager at FONTEC, because Dr. Jorge Olivares, Operations Director, was traveling at that time. Mr. González showed enthusiasm to collaborate in different ways with CamBioTec activities in Chile. e.g. business missions to Canada, co-organization of events like a seminar on Financial Management in Biotechnology, etc. Coordination is now ongoing between Dr. Gil and FONTEC to define the nature and extension of this collaboration.

**3:00 pm Working Session at Universidad de Chile**

The consultant and Dr. Gil completed a first draft of the preliminary proposal, to be discussed with CONICYT later in the afternoon (this session continued from 6 to 8 pm, after the next meeting). In order to show transparent behaviour in the preparation and approval of the proposal, a second meeting with all representatives who attended the seminar was called by the consultant for the next day in CONICYT, to inform everyone about his activities and to present the preliminary proposal for IDRC.

**4:30 pm Meeting with Dr. Ximena Gómez de la Torre, CONICYT**

The proposal and budget contribution from CONICYT was discussed. The nomination of Dr. Lionel Gil as the Coordinator of the Focal Point was strongly suggested and accepted by Dr. Gómez. Minor changes in the budget were suggested. Dr. Gómez offered to have the revised proposal approved by Dr. Enrique D'Etigny in about a week (Dr. Gil informed the consultant by fax that CONICYT had approved the proposal on April 19).

**Friday, April 12**

**9:00 am Meeting with Dr. Juan Izquierdo, Technical Secretary, REDBIO-L, FAO**

FAO's Technical Cooperation Network on Plant Biotechnology in Latin America and the Caribbean (REDBIO-L) was established and has remained operational since 1991, with the following objectives:

- a) to support the formulation of national policies;
- b) to promote training and exchange of information and biological material;
- c) to support cooperative research projects among member laboratories and/or developed countries; and
- d) to promote the preparation of a Code of Conduct on plant biotechnology.

413 plant biotechnology laboratories in 25 countries are constituent members of REDBIO, which has established an Internet Listserv Group to exchange information about conferences, courses, news (trimestral newsletter), as well as to promote e-mail discussions. REDBIO has also developed an electronic databank (CATBIO 2.0). Every three years, REDBIO organizes an important regional event (Iguazú, Argentina, 1995). Dr. Izquierdo is very interested to develop a comprehensive collaboration agreement between REDBIO and CamBioTec, especially in the co-organization of national (Brazil) and sub-regional (MercoSur) workshops on Setting Priorities in Ag- Biotech; in the development of studies/workshops about socio-economic and environmental impacts of ag-biotech in Latin America; and

in the promotion of technology transfer. Dr. Izquierdo suggested a visit to IDRC-Ottawa in order to discuss possible collaboration mechanisms with CamBioTec. IDRC has already invited him to attend, with FAO's support, the CamBioTec Coordinators Meeting (Ottawa, June 10-11, 1996).

**11:00 am          Visit to Sociedad Minera Pudahuel (SMP-TEC)**

This mining company has developed, patented, commercialized and transferred a hydro-metallurgical process to treat raw copper mineral (sulfides), which includes bioleaching as the first unit process. The bioleaching process is being applied in Lo Aguirre, the mine visited near Santiago, which has eliminated the old, polluting and costly pyrometallurgical process. Minera Pudahuel has created SMP-TEC, as a subsidiary company exclusively working on the development of new technological developments and applications. We were received by Eng. Sergio Bustos and Eng. Romilio Espejo, Superintendent and Researcher at SMP-TEC. Technology transfer contracts have been signed with Canadian firms Rio Algom and Cominco, for the use of this technology in Cerro Colorado and Quebrada Blanca mines in the North of Chile, respectively. SMP-TEC is currently working on bioleaching of copper from chalcopyrite. They are interested to contact potential partners in Canada for gold and nickel bioleaching.

**3:00 pm          Working Session at Universidad de Chile**

The final version of the preliminary proposal was reviewed and printed. It considers a 2-year global budget of Can\$608,772 from which IDRC's contribution is Can\$100,000, CONICYT contributes with Can\$52,500, EuroChile contributes Can\$62,500 and other contributions of Can\$393,772 (from FONDEF, FONTEC, FIA, CONAMA, Environment Canada, individual firms, and others).

**4:00 pm          Second Meeting with Chilean representatives, CONICYT**

Because of the late invitation and hour, this meeting was only attended by people representing CONICYT, EuroChile, CONAMA, and Universidad de Chile. However, many of the 22 invitees apologized for not attending themselves and offered strong support to CamBioTec activities in Chile (e.g. INIA, INFOR, RedBio, CIDA-Santiago, FIA, etc). The consultant informed everyone about his meetings and visits, and presented the main components of the proposal. Dr. Ximena Gómez de la Torre offered to improve the proposal by adding some aspects of policy promotion, to circulate it among CONICYT's members for comments, and hopefully to have it approved in about one week. A copy of the preliminary proposal discussed during this meeting is attached in Annex 3 (also a diskette is attached). As well, a full resume of Dr. Lionel Gil, the proposed coordinator of the Chilean focal point is attached in Annex 4.

**Saturday, April 13**

**8:00 am          Departure from Santiago to Buenos Aires**

#### 4. ACTIVITIES IN BRAZIL

At their own request, three representatives of CENARGEN-Embrapa participated as observers (using their own funds) in the CamBioTec Workshop "Methodologies for Setting National Priorities in Biotechnology" (Mexico DF, November 6-9, 1995). As a result of this participation, the CENARGEN-Embrapa delegation showed a great interest to become the Brazilian Focal Point of CamBioTec and committed themselves to obtain internal support to prepare a formal proposal to IDRC, which may also consider the participation of ABRABI. Intensive coordination proceeded smoothly with Dr. Mauro Carneiro from January up to early March 1996, when internal changes at Embrapa resulted in the nomination of Dr. Damares Castro Monte-Neshich as the coordinator of the consultant's visit. These changes motivated the modification of the consultant's travel plans, shifting the visit to Brazil from the first to the third week of April. The new schedule of activities in Brazil was finally confirmed on March 28, which included a one-day visit to BIO-RIO and ABRABI in Rio de Janeiro. Damares and/or her assistant (Marilda Prudente, MSc) accompanied the consultant to most of these meetings. The schedule of activities and the references of people contacted in Brazil are shown in Annexes 5 and 6, respectively. The activities performed by the consultant in Brazil are summarized below.

##### **Saturday, April 13**

11:00 pm      **Arrival to Brasilia from Buenos Aires**

##### **Monday, April 15**

9:30 am      **Meeting with Dr. Alfonso C. Candeira Valois, Director General CENARGEN**

A short but warm welcome meeting. Dr. Valois offered support for creating a CamBioTec focal point at CENARGEN and mentioned some of the ag-biotech research areas they are currently working on, in particular the area of genetic resources (Dr. Eduardo A. Vilela Morales, Head). Concerning environmental issues, he mentioned some important activities in Brazil like those developed by Grupo Ultra in Sao Paulo (joining the 40 most important companies) in the field of microbial bioremediation, the work of CENA (Piracicaba) and CETEM (Rio de Janeiro) on the use of "aguapé" (water hyacinth) for biosorption, and the work of Embrapa's Centro de Meio Ambiente (near Campinas, SP). The possible collaboration of BIO RIO and ABRABI was also strongly suggested to complement CENARGEN's weakness in entrepreneurial issues.

10:00 am      **Visit to the biotechnology laboratories of CENARGEN**

Most of the research programs visited are co-funded by international or bilateral cooperation agencies. Dr. Elibio Rech, a genetic engineer, has developed a high-pressure helium hand-held biogun device (patent applied) to introduce and express foreign genes in animal tissues *in vivo*, by bombarding gold microparticles coated with the plasmid DNA to guinea pigs ears and then cattle ears. He provided some papers which are available at CIB.

Dr. Joao Batista Tavares is working in different areas of biological control, where the success of Baculovirus against the soya bean bug (*Anaticarsia gemmatalis*) has spread its use in about 1 million hectares (including some farms in Argentina and Paraguay). He mentioned that Dr. Flavio Moscardi at CNPSo-Embrapa/Londrina, Paraná (fax: 55-43-320-4186, e-mail: moscardi@cnpso1.embrapa.anpr.br), is

doing a study on the environmental impacts derived from the commercial introduction of Baculovirus. Dr. Tavares is now more focused on the Bacillus sphericus to fight different fungus in beans, corn, etc.

Dr. Roberto de Bem, a veterinarianiany medecin, is working on the preservation of Brazilian animal germplasm by identifying local varieties, collecting *in vivo* and *in vitro* specimens, studying their characteristics, multiplying populations, and thus adding value to the regional animal genetic resources (cattle, buffalos, swine, horses, goats, sheep). Modern techniques are applied like: non-surgical embryo collection, cryopreservation of mammalian oocytes and embryos, embryo transfer, oogenesis, *in vivo* oocyte collection, etc.

**2:00 pm            CamBioTec Seminar at CENARGEN (Auditorium)**

Due to the changes in the coordination, and bureaucratic concerns of Embrapa (internal authorization only) the seminar was restricted to the staff of CENARGEN and Embrapa. No other institution was invited by CENARGEN nor by IDRC. Total attendance was 12 managers or senior researchers. Dr. Damares Castro introduced the consultant, who made a 40-minute presentation (using overheads) about the bioindustry in Canada, IDRC's involvement in biotechnology, and CamBioTec's origins, mission, goals, current and future activities/developments. Although the discussion was scarce, the participants expressed their willingness to participate in CamBioTec, as it was seen as the right program arriving just in time for the needs of CENARGEN and Embrapa to commercialize their biotechnology innovations and to develop links with the industrial sector, at the national and international level. At this point, it was not very clear who will be the focal point: Embrapa or CENARGEN (a branch of Embrapa), and Damares concluded that the following meetings and visits will help to take the appropriate decision.

**4:30 pm            Meeting with Mr. Richard Smith, Counselor, Development Cooperation - CIDA**

Because of the coordination changes, this meeting was first postponed two weeks, and then from Monday morning to late afternoon. Nevertheless, Mr. Smith arranged the meeting at the Canadian Embassy, together with Ms. Maria Teresa Nunes dos Santos (Advisor, Technical Cooperation-CIDA). Mr Smith changed from initial skepticism to an increasing interest about CamBioTec and the possible funding of the local focal point through CIDA's Technology Transfer Fund for Brazil. As this fund has been restricted to support the promotion of socio-economic and environmental aspects of development, it was necessary to explain the direct linkages between many areas of ag-biotech (biopesticides, biofertilizers, etc) and the environment. Mr. Smith did not foresee any problems with funding a CamBioTec focal point and offered to consider a specific proposal duly prepared under CIDA guidelines. Finally, he offered to have another meeting by Thursday, when a preliminary proposal had been developed. Unfortunately, time and bureaucratic limitations at Embrapa did not allow for the timely preparation of this document and the meeting was canceled. It is important to maintain Mr. Smith's interest in the issue by providing him with the preliminary proposal, as soon as it is received in Ottawa.

**Tuesday, April 16**

**8:30 am            Meeting at the International Cooperation Direction (ACI) of EMBRAPA**

The first part of this meeting was with Mr. Francisco Reifschneider, Director of ACI-Embrapa. The meeting began poorly due to Mr. Reifschneider's adversarial personality and his focus on using CamBioTec to generate revenue for Embrapa. Then he introduced the Embrapa's team to continue the discussion: Ms. Marisa M. Barboza, Director of Strategic Administration Secretary (SEA); Mr. Amalio D'Alagnol (Head, DEC); Mr. Kazuyoshi Ofugi (Coordinator, Marketing and Commercialization); Mr. Marcus Ligocki (Advisor ACI); and Mr. Elmar Da Cruz (Advisor ACI), who attended the CamBioTec workshop in Mexico DF. The second part of the meeting was quite encouraging because the members of Embrapa team easily recognized the potential benefits derived from Embrapa's involvement in

CamBioTec and the coordination flowed smoothly. In particular, Embrapa and CENARGEN are interested to use CamBioTec to validate and commercialize their innovations. Later, the Embrapa team joined the CENARGEN team (Damares, Marilda, Dr. Mauro Carneiro and Eng. José Francisco B. Mendonça) and they all committed to work together to prepare the proposal for IDRC.

**10:30 am Meeting with Dr. Sebastião Saldanha Neto, IBAMA**

This meeting did not take place because the workers of Instituto Brasileiro de Meio Ambiente (IBAMA) had just joined the Public Service strike started the previous day. The strikers did not allow anybody to enter the building. Furthermore, it was impossible to find or call Mr. Saldanha. Apparently, he did not go to work.

**2:00 pm Meeting with Dr. Eliana Fontes, National Biosafety Commission**

Dr. Fontes, the Executive Secretary of this Commission, explained that a new biosafety law (approved in January 1995) has just been regulated (December 1995), although the implementation of the law has some delays. She provided copies of the law and the regulatory bill, which are available for CamBioTec members at CIB. Eliana is interested in fostering collaboration with Canada for training of human resources in agri-food biosafety. The CIB will send her appropriate information on a regular basis (e.g. the 8th Symposium on Environmental Releases of Biotechnology Products, Ottawa, June 23-26, 1996).

**3:00 pm Working Session at CENARGEN**

This session was not attended by Damares, who was very busy in her new position of Director of Biotechnology at CENARGEN. Marilda Prudente and the consultant tried to collect some information for the proposal, but the unavailability of a computer did not allow further development. The consultant had the opportunity to talk frankly with Dr. Mauro Carneiro about CENARGEN's political situation and some recent changes at the senior management level which might have created internal tension. Nevertheless, Mauro will do his best to ensure the success of CamBioTec activities in Brazil.

**4:00 pm Presentation of CamBioTec at SEBRAE**

The Serviço Brasileiro de Apoio as Micro e Pequenas Empresas (SEBRAE) is a private, not-for-profit organization created to promote the development of small and medium enterprises, and is administered by a board whose representatives come mostly from the private sector. SEBRAE has an important source of funds coming from a taxation of 0.3% on all salaries paid by registered companies (about US\$228 million in 1994). SEBRAE currently supports programs aiming to increase technological skills and international competitiveness of SMEs, which include, among others, the organization of commercial missions and business rounds, participation in fairs and exhibitions, dissemination of business opportunities, promotion of joint-ventures, promotion of links with universities and R&D institutes. Following the suggestion of the consultant, a CamBioTec overhead presentation was arranged with Dr. Ilma Ordine Lopes, Principal Advisor at the Presidency of SEBRAE, and Mr. Newton Arguello, General Manager of Foreign Trade Promotion. Ilma and Newton were quite impressed with the goals of CamBioTec and quickly offered collaboration for specific activities of the focal point, and even to consider a contribution for operational costs. Ilma mentioned an ongoing Biotechnology Sub-contracting Program (PROTEC) jointly organized by SEBRAE and BIO-RIO in Rio de Janeiro; and SEBRAE's involvement in Fundação BIOMINAS in Minas Gerais. Particularly, there is a special interest to organize a Brazil-Canada Ag-Biotechnology Business Round in Sao Paulo, with possible extension to the MercoSur countries (it would need 3-4 months to be organized). Ilma would be happy to receive a draft proposal for this event.

**Wednesday, April 17**

**9:00 am Meeting with Dr. Lourival Carmo Mónico, President of FINEP**

Financiadora de Estudos e Projetos (FINEP) is the financial arm for technological development in Brazil, well known for its bureaucratized procedures. FINEP normally lends money to well established companies and also offers risk capital in innovation projects up to a maximum of 50% of the project cost. Dr. Mónico was interested in discussing the business aspects of CamBioTec, and was not very interested in the activities related to socio-economic studies. He had previously contacted Jim Mullin and appreciates IDRC's policy of funding R&D in the developing world. At the end of the conversation he was convinced and ordered Mr. Yu Chi Au, Cabinet Chief at FINEP, and Ms. Maria Elisa Tourinho Jaguaribe, Advisor Chief of International Cooperation, to coordinate with the CENARGEN-Embrapa team (Damares, Kazuyoshi Ofugi and Marcus Ligocki were also there) in order to reserve a contribution for the operation of the Brazilian focal point of CamBioTec. The meeting was a complete success.

**11:00 am Meeting with Dr. Hugo Paulo N.L. Vieira, CNPq**

The Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) is the main S&T federal funding agency in Brazil. CNPq's share is about 28% of the federal S&T expenditures, which represented US\$594 million in 1994. Originally, it was planned to meet Dr. Guillermo Brandão (Director, Technology Development & Articulation), but he had to travel suddenly. Thus, the consultant met Dr. Vieira, Coordinator of Institutional Programs, who became quickly impressed and interested about the possibilities offered by CamBioTec for collaboration with CNPq. Indeed, he mentioned BIOEX (Programa Biotecnológico de Apoio a Competitividade Internacional da Agricultura), a special CNPq program oriented to promote high quality exports of fruits and pulp & paper, with emphasis on tissue culture, micropropagation, biofertilizers, biological control and reforestation. Dr. Carlos Enrique de Carvalho, the manager of BIOEX, also attended the meeting. CNPq is also promoting biotechnology in animal production, aquaculture and the environment. Concerning the latter, CNPq is supporting the National Network of Chemical Waste, where various issues are being developed, e.g. inventory of national labs, modification of laws about allowed limits, etc. Dr. Vieira was so excited about CamBioTec that he suggested that CNPq become the Brazilian focal point. In any case, Dr. Vieira offered collaboration and support from CNPq to the activities of CamBioTec in Brazil.

**2:00 pm Meeting with Dr. Maria José Amstalden M. Sampaio, CENARGEN**

Dr. Sampaio was the former Director of Biotechnology at CENARGEN, and she is particularly working on biosafety issues. A brief meeting was held with her to discuss the most appropriate issues to be addressed by CamBioTec in the area of socio-economic and environmental impacts of ag-biotech in Brazil. Two possible studies were discussed: the anti-virus transgenic papaya transferred from Cornell University through ISAAA to Brazil (still to be disseminated to the farmers), and the biocontrol of soya bugs using Baculovirus (1 million hectares in use). She pondered about the validity of a study on Baculovirus almost 10 years after its initial dissemination. On the other hand, a study on transgenic papaya could be scientifically monitored by Brazilian and international scientists, in a restricted geographical area where inexpensive ex-ante and ex-post surveys could be easily performed by a small team of students. Most important is the fact that the results of the study will certainly be very important in influencing local policies and the choice of farmers, who are currently suffering export falls and tremendous losses from virus-infected fruit. Dr. Sampaio has good contacts with ISAAA and Cornell University; she could be a good contact for IDRC to get specific comments on the papaya proposal.

**3:00 pm Working Session at CENARGEN**

Marilda and the consultant obtained access to a computer and started to prepare the proposal outline, the general information on participating institutions, and the status of biotechnology in Brazil, using material



and papers collected during the week by the team. Unfortunately, Damares was still busy with internal meetings and protocols, and she had no time available to discuss the main activities to be developed by the focal point, without which it was not possible to continue developing the proposal at that time.

**7:00 pm Meeting with Mr. Antonino de Andrade, Deputy & Cabinet Secretary, State of Goias**

The State of Goias (about 4 million people) geographically surrounds Brasilia's DF. Their politicians, who are active lobbyists in Brasilia, are willing to transform this state into the Brazilian Florida by promoting investment in modern agri-food and bio-pharmaceutical technologies. Emerging prosperous cities like Goiania (the capital) and Anapolis (1130 km from Brasilia) are already promoting the creation of technology parks. Following a suggestion from Damares, the consultant met Mr. Antonino de Andrade in the lobby of his hotel. Specifically, Mr. Andrade proposed to collaborate with CamBioTec to organize a Canada-Goias business round on agri-food biotechnology in Anapolis, in a near future, for which he committed support from the State of Goias. He promised to coordinate this possibility with Damares Castro and eventually will send a draft to CIB.

**Thursday, April 18**

**9:00 am Working Session at CENARGEN**

A final meeting with the members of the Embrapa team (Elmar Da Cruz, Kazuyoshi Ofugi and Marcus Ligocki) and the CENARGEN team (Marilda Prudente, Mauro Carneiro and Jose Francisco Mendonça) took place at Marilda's office. They agreed that CENARGEN was better suited than Embrapa to become the formal focal point. A strategy to convince Embrapa's authorities was designed. The consultant was happy to hear of their commitment to complete the proposal in the next two weeks.

**10:30 am Meeting with Dr. Alberto Duque Portugal, President of EMBRAPA**

The Empresa Brasileira de Pesquisa Agropecuaria (Embrapa) is the main federal S&T agency in the agricultural sector in Brazil. Embrapa's share is about 13% of the total federal S&T expenditure, which represented US\$282 million in 1994. At the end of an internal awards ceremony at CENARGEN, the consultant had the opportunity to meet Dr. Portugal, as well as Dr. José R. Rodrigues Peres, Executive Director of Embrapa. They were aware of CamBioTec and the consultant's visit (a letter was sent to Dr. Rodrigues Peres in March), but it seemed that they only realized the importance of institutional participation (validation of their biotechnologies) after the previous meetings and visits during the week. At this occasion, and in the presence of Damares Castro, Dr. Portugal formally offered the support of Embrapa to become the focal point of CamBioTec. However, it was clear that CamBioTec is not one of the highest priorities for Embrapa, and further efforts by Damares and the CENARGEN-Embrapa team will be required in order to get final approval of the proposal from Dr. Portugal.

**12:00 am Meeting with Dr. Luiz Antonio Barreto de Castro, Ministry of S&T**

The Ministry of Science and Technology administers about 42% of the total federal S&T expenditure in Brazil (US\$928 million), which includes CNPq expenditures. In 1985, Brazil received from the International Reconstruction and Development Bank (World Bank) a loan of US\$150 million to develop the Programa de Apoio ao Desenvolvimento Científico y Tecnológico (PADCT) during 5 years. The Ministry of S&T administered this loan, which was renewed at double amount in 1990 for the period 1991-96. During this first phase (10 years), PADCT was mainly oriented towards academic research. Phase II, mainly oriented towards commercialization, the enterprise, is now under preparation and should start on January 01, 1997. The new phase includes a specific biotechnology sub-program on transgenic plants, where CamBioTec as well as ISAAA could play an important role. The consultant arranged a meeting with Dr. Barreto de Castro, Director of Special Programs at the Ministry of S&T. Dr. Barreto

was the former Director of CENARGEN and is well aware of biotechnology developments in Brazil. Dr. Barreto would like to receive information from CIB about transgenic plants developed in Canada which are ready to be transferred. Finally, Dr. Barreto offered to collaborate on those specific activities of the Brazilian focal point which match with PADCT priorities and goals.

**2:00 pm Final Working Session at CENARGEN**

General aspects of the proposal were further developed, waiting for the definition of the activity plan in Rio, together with Dr. Paes de Carvalho (BIO RIO). The fact that Marilda was busy obtaining her air ticket to Rio, and Damares was still busy with meetings did not permit further development of the proposal. However, Marilda was assigned the specific task of writing the proposal, in coordination with other team members.

**6:00 pm Departure to Rio de Janeiro**

**Friday, April 19**

**9:00 am Meeting with Dr. Antonio Paes de Carvalho, BIO-RIO**

Dr. Paes de Carvalho, General Secretary of Fundação BIO RIO, is also the president of Associação Brasileira de Empresas Biotecnológicas (ABRABI). He explained the reasons why he did not accept the invitation of IDRC to prepare a proposal for a focal point or CamBioTec in Brazil, last year. Now, that Embrapa is already involved, he will be happy to collaborate in the administration of the focal point, by providing the necessary entrepreneurial approach. Then, he explained the administrative aspects of BIO RIO, accompanied the consultant to visit VITROGEN, provided a guide for a tour to the BIO RIO incubator, and postponed to 3 pm the discussion of the focal point.

**10:00 am Visit to VITROGEN Biotecnología, BIO RIO**

VITROGEN is a privately owned Brazilian biotech firm located at the technology park of BIO RIO, funded in 1994 to develop R&D and commercial production of plants through tissue culture and micropropagation technology. The firm now has a transplanting room with two laminar flow benches, controlled incubators, specially lighted growing rooms, and also shaded nursery areas. The current production capacity is 0.5-1.0 million plants per year, mostly ornamentals for export, but also banana, citrus, tobacco, eucalyptus for the domestic market. Mr. Paulo Cesar Hargreaves and Mr. Christian Michael Marzari are the associate owners and managers of VITROGEN. In particular, Mr. Hargreaves shows an impressive entrepreneurial personality, having mentioned a number of new projects or ideas to be developed in the future, e.g. micropropagation of medicinal plants and bromeliaceas, aquaculture of ornamental fishes, validation of the rich biodiversity of Mata Atlantica forest (near Rio de Janeiro), etc. He would be interested to explore the latter using international funds from CIDA or IDRC. Mr. Hargreaves would be a strong supporter of CamBioTec activities in Brazil.

**11:00 am Visit to BIO RIO, an Incubator and Technology Park**

Located on the campus of Universidad Federal de Rio de Janeiro-UFRJ (Ilha do Fundao), BIO RIO is a science & technology park created by a joint effort of local scientific institutions, the industry and the government (federal, state and municipal). The park is managed by Fundação BIO RIO, a not for profit NGO, which promotes interaction between academia and industry, using the small high-tech firms already established as an important interface. BIO RIO has 207,000 m<sup>2</sup> of land immediately adjacent to the Biosciences Research Facility of Universidade Federal de Rio de Janeiro (UFRJ). 3,000 m<sup>2</sup> of this land are covered and houses today 8 small enterprises: four are active in laboratory supplies and diagnostic kits for human health; one is engaged in quality control of natural product materials for

pharmaceutical firms; one is entering the market of micropropagated plants (VITROGEN); and two others are still installing their facilities. Furthermore, there are 4 others in the contracting stage. The five companies which were active in 1994 sold more than US\$1.6 million in that year with a total staff of 32 people (average revenue over US\$50,000/employee/year). BIO RIO offers a number of services to the established firms, client industries and university R&D groups: the most important one is the management of 68 joint science-industry projects; the provision of *on line* and *off line* technical assistance to SMEs (through an agreement with SEBRAE; a sub-contracting service for bioindustries funded by SEBRAE (named PROTEC); and finally close connections with a scientific network of 121 research groups (from UFRJ, U. Federal Rural and Instituto Oswaldo Cruz). The consultant was able to verify these statements by visiting each one of the established firms in the biotechnology incubator-park.

**3:00 pm            Working Session about the Brazilian Focal Point**

Dr. Paes de Carvalho, Damaraes Castro, Marilda Prudente and the consultant discussed mechanisms for the collaboration of BIO RIO, ABRABI, CENARGEN and Embrapa to build a strong focal point of CamBioTec in Brazil. The main conclusions of the discussion were:

- a) Embrapa would be the formal focal point, and would sub-contract BIO-RIO (better than ABRABI) to establish and operate a joint venture office of CamBioTec.
- b) There is a memorandum of understanding between ABRABI and Embrapa to allow the latter to become ABRABI's Regional Direction for the Center-North of Brazil. This will facilitate interaction with firms, by sharing the administration of CamBioTec with regional institutions.
- c) CamBioTec Brazil should establish an advisory or coordinating board with representatives of the most involved institutions. This board should not be too numerous (e.g. 7 people representing CENARGEN, BIO RIO, ABRABI, SEBRAE and/or FINEP).
- d) ABRABI and BIO RIO would help the focal point to establish electronic links by using their computer network linking different regional biotechnology incubators and parks in Brazil. The most important nodes are at FIOCRUZ, BIOMINAS, CINTEBIO, CDP/Joinville, Biotechnology Center of UFRGS, U.Campinas, U.Piracicaba, USP, Instituto Butantan, IPT, among others Brazilian leading biotech institutes.
- e) BIO RIO could also efficiently administer specific activities of CamBioTec (seminars, missions, fairs) in close coordination with CENARGEN-Embrapa.
- f) BIO RIO may also help CamBioTec to export the concept of PROTEC (Programa de Terceirização Tecnológica), an interesting mechanism for sub-contracting biotech services/products, established by SEBRAE with the collaboration of BIO RIO.
- g) The focal point may help to create momentum for the creation of a Biotechnology Park in Brasilia, within the premises of CENARGEN-Embrapa, with the collaboration of CamBioTec, CENARGEN, BIO RIO and ABRABI.

**5:00 pm            Wrap-up of the visit to BIO RIO**

There was a confident and satisfactory feeling among the participants about the prospects to build a CamBioTec focal point in Brazil in the near future. Most of the responsibilities are now on Damaraes Castro, who has the will and political level to have the proposal completed and approved at CENARGEN-Embrapa.

**10:00 pm          Departure from Rio de Janeiro to Ottawa**

**Saturday, April 20**

**2:00 pm            Arrival to Ottawa**

## 5. OTHER ACTIVITIES (ARGENTINA)

At the request of Dr. Juan Dellacha, coordinator of the CamBioTec Focal Point in Argentina, the consultant modified his flight schedule in order to make a stop over of some hours in Buenos Aires on Saturday, April 13th, and thus have the opportunity to meet him and exchange information about CamBioTec developments in Argentina. The main issues of our discussions are shown below :

**Priority Setting Exercise:** Dr. Dellacha has set a Sectorial Committee to prepare a background study in Animal Production and Veterinary (deadline: May 31), as a background information for the workshop. Parallel committees in Agriculture and Agro-industry are being implemented. No dates are fixed yet for the workshop (June-July?).

**Public Awareness:** A 2-month campaign to develop public awareness will be performed by 2 journalists, funded by CamBioTec Argentina in July-August. Media: agro-oriented revues (La Chacra, Campo) & journals (Clarín, Nación). At Dr. Dellacha's request, the CIB is sending him a bunch of Canadian dissemination articles and studies in order to orient the Argentinean journalists.

**CYTED Meetings :** Dr. Dellacha is traveling to Portugal and Spain from April 26 to May 14, to make presentations in CYTED meetings (Comisión Hispano-Americana de Ciencia y Tecnología para el Desarrollo) and other events. At his request, the CIB has sent him a set of colour, Spanish version, CamBioTec overhead transparencies for dissemination purposes.

**BIO-SIDUS:** The most important Argentinean bio-pharmaceutical firm is looking for a Canadian consultant with expertise in patenting biopharmaceuticals in the US and Canada. The CIB has identified and sent him the references of the most appropriate consultant: Ms. Joy D. Morrow, Barrister and Solicitor, Patent and Trade Mark Agent at Smart & Biggar - Fetherstonehough & Co., Ottawa.

**ABIC'96:** Dr. Dellacha has already registered for this event in Saskatoon and is promoting the participation of entrepreneurs. At his request the CIB has sent him 10 pamphlets with the final program.

**Second Payment:** Dr. Dellacha gave me copies of his 6-month technical and financial report and asked me to follow up with IDRC in order to have the second payment sent as soon as possible (this has already been coordinated with Marleny Tanaka).

**Budget:** Dr. Dellacha expressed the following concerns, which could be considered by IDRC when submitting a proposal to CIDA's Technology Transfer Fund for the Southern Cone:

- a) Dr. Maria Isabel Pacini, microbiologist expert in vaccines (ex-INTA, ex-Labs.BAGO) is collaborating with CamBioTec at 4 hours/day, \$600/month (less \$160/month for her retirement fund). Dr. Dellacha would like to have her working full time for CamBioTec in Year II.
- b) Dr. Dellacha's sabbatical from CONICET will end on August 31, 1996. Starting September 01, he would request a non-paid license to CONICET in order to work full time in CamBioTec, depending of IDRC funding. His yearly salary charged to CamBioTec would increase from \$10,000 to \$36,000.

## 6. CONCLUSIONS AND RECOMMENDATIONS

1. **Promotion of CamBioTec in Chile:** A total of 22 organizations were visited or contacted, including industrial (5), policy (4), financial (5) and research (8) groups. Chilean institutions and firms are quite aware about the current and future role of biotechnology in adding value to food and natural resources, preserving the environment and increasing Chile's share of international markets. Thus, CamBioTec concept was welcomed as the perfect program arriving just in time to coordinate local efforts in building a sustainable commercial biotechnology in Chile.
2. **Funding sources for CamBioTec in Chile:** Among the policy and financial institutions visited in Chile, the consultant has identified the availability and willingness to co-fund either the operation (CONICYT, EuroChile), or specific activities (FIA, FONDEF, FONTEC, CONAMA) of the Chilean focal point of CamBioTec. In general, CamBioTec may benefit from the availability of different specific programs or funds oriented to promotion of biotechnology in Chile.
3. **CIDA's Technology Transfer Fund for the Southern Cone:** Discussions with CIDA's officers in Santiago were positive and have opened to CamBioTec the option for applying to this fund in order to obtain the Canadian counterpart for activities in Chile, a complementary counterpart for activities in Argentina, as well as the corresponding Canadian expenditures.
4. **Proposal for a Focal Point of CamBioTec in Chile:** Due to efficient work with Dr. Lionel Gil's team at the Universidad de Chile, as well as to the general level of awareness about the future role of biotechnology in Chile, a preliminary proposal could be coordinated, prepared, discussed with local sponsors, and preliminarily approved by EuroChile and CONICYT. The proposal includes a 2-year schedule of activities with a total budget of Can\$608,772 where IDRC's contribution is Can\$100,000 (to be obtained from Canadian sources), and that of local sponsors is Can\$115,000 (CONICYT and EuroChile), as well as other contributions for specific activities to be obtained by the Chilean and Canadian focal point. The revised proposal would have already been approved by CONICYT and should arrive to IDRC-Ottawa very soon (Dr. Gil's E-mail of 19-04-96).
5. **Promotion of CamBioTec in Brazil:** A total of 18 organizations were visited or contacted, including industrial (3), policy (4), financial (5) and research (6) groups. This does not represent the whole biotechnology community of Brazil. However, the mission allowed CamBioTec to establish strong links with organizations having a national scope (like EMBRAPA, FINEP, SEBRAE, ABRABI) or being regional leaders within national networks (like Fundação BIO RIO). In general, the CamBioTec concept was welcomed as the right program arriving just in time to coordinate local efforts in building sustainable commercial biotechnology in Brazil.
6. **Funding sources for Brazil:** Among the policy and financial institutions visited in Chile, the consultant has identified the availability of funds and the willingness to co-fund either the operation (Embrapa, FINEP), or specific activities (SEBRAE, CNPq, Ministry of S&T) of the Brazilian focal point of CamBioTec. In general, CamBioTec may benefit from the availability of different specific programs or funds specifically oriented to promote biotechnology in Brazil.
7. **Proposal for a Focal Point of CamBioTec in Brazil:** The proposal could not be completed during the mission because of the following problems:
  - a) recent changes inside CENARGEN affected the coordination of the visit, which had to be delayed at the last minute;
  - b) the bureaucratic management at Embrapa did not timely empowered the new coordinator in order to discuss and advance details of the proposal, together with the consultant.

Nevertheless, at the end of the mission in Brazil, the descriptive parts of the proposal had been completed, however, the essential components (Activity Plan, Focal Point, Budget) needed some lobbying to obtain the formal support of Embrapa. According to Damares Castro, the proposal should be completed, approved and sent to IDRC-Ottawa before the end of May.

8. **CIDA's Technology Transfer Fund for Brazil:** Discussions with CIDA's officers in Brasilia were positive and have opened to CamBioTec the option for applying to this fund in order to obtain the Canadian counterpart for activities in Brazil, provided the proposal can properly justify the activities as being promoting the environment and socio-economic development, which are the Fund's priorities for Brazil.

9. **Recommendations for IDRC:**

- a) To send the Chilean proposal to André Deschenes and Ramiro Trucco in Santiago for comments.
- b) To send the Brazilian proposal, once arrived, to Richard Smith in Brasilia for comments.
- c) To start formal contacts with Stuart Lane and Michael Brownell at CIDA/Hull about submission of CamBioTec proposals to the Technology Transfer Funds for the Southern Cone and Brazil, respectively.
- d) To develop, together with CIB, a formal proposal to CIDA's Technology Transfer Fund for the Southern Cone, based on the Chilean proposal, complementary activities in Argentina and the related Canadian expenditures.
- e) To develop, together with CIB, a formal proposal to CIDA's Technology Transfer Fund Brazil, based on the Brazilian proposal and the related Canadian expenditures.
- f) To invite Dr. Lionel Gil and Dr. Damares Castro to attend the CamBioTec Coordinators Meeting and the ABIC'96 Conference from June 09 to 14 (Ottawa and Saskatoon).
- g) To invite Dr. Juan Izquierdo/FAO to Ottawa, with his own travel funds, to discuss possible collaboration between CamBioTec and Red Bio - FAO.

10. **Recommendations for CIB:**

- j) To coordinate with Lionel Gil and CONICYT the formal submission of the Chilean proposal to IDRC.
- k) To request Damares Castro to send the preliminary Brazilian proposal for comments, and then the formal submission of the final version to IDRC by CENARGEN-Embrapa.
- l) To prepare together with IDRC and Dr. José Luis Solleiro, the corresponding CamBioTec proposals to CIDA's Technology Transfer Funds for the Southern Cone and Brazil.
- m) To submit, together with CONICYT, Foro Argentino de Biotecnología, CENARGEN-Embrapa and IDRC corresponding proposals to CIDA's Technology Transfer Funds for the Southern Cone and Brazil.
- n) To reply to all request received from Chilean and Brazilian organizations during the mission (information exchange, dissemination of profiles, identification of potential partners, etc).

**ANNEX 1:            Schedule of Activities in Santiago, Chile**

*CamBioTec*

PROGRAMA DE ACTIVIDADES EN  
SANTIAGO

DR. JAVIER VERASTEGUI  
INSTITUTO CANADIENSE DE  
BIOTECNOLOGIA

ABRIL 8 - 12, 1996

SANTIAGO, CHILE



# VISITA A CHILE Dr. JAVIER VERASTEGUI

## CAMBIOTEC

### Programa de Actividades

#### Lunes 8 de Abril:

- 9:00 hrs. Reunión Ingeniero Aníbal Megge SOFOFA
- 10:30 hrs. Reunión con el Directorio de Biotecnología de la Fundación EuroChile
- 15:00 hrs. Reunión con Margarita D'Etigny Consejo de Innovación Agraria
- 15:45 hrs. Reunión con Ingeniero Enrique D'Etigny Presidente Conicyt
- 16:00 hrs. Reunión Comité Nacional de Biotecnología Conicyt
- 16:30 hrs. Reunión con Jorge Yutronic, Presidente de FONDEF

#### Martes 9 de Abril:

- 9:00 hrs. Seminario: Biotecnología para el cambio. Una iniciativa Canadiense en América Latina. Establecimiento de un Punto Focal en Chile. Dr. Javier Verástegui. Instituto Canadiense de Biotecnología. Fundación EuroChile
- 11:30 hrs. Reunión con Andrés Deschenes en la Embajada de Canadá
- 14:00 hrs. Reunión de trabajo (J. Verástegui, L. Gil y eventualmente otros representantes de EuroChile y CONICYT)

#### Miércoles 10 de Abril:

- 9:15 hrs. Visita a INIA (Carlos Muñoz)
- 11:30 hrs. Visita a PUCC (Ricardo San Martín / Ingeniería Química)
- 14:30 hrs. Visita a Bios-Chile (Arturo Yudelevich o representantes)
- 16:30 hrs. Visita a PUCC (L. Holuigui / Coordinador RedBio-Chile)

#### Jueves 11 de abril:

- 9:00 hrs. Visita a CONAMA (Leonel Sierralta)
- 11:00 hrs. Invitación a CONICYT, Ceremonia de Celebración de Aniversario.
- 14:00 hrs. Reunión de trabajo (J. Verástegui, L. Gil, otros representantes)

#### Viernes 12 de Abril:

- 9:00 hrs. Visita a FAO (Dr. Juan Izquierdo / Secretario Ejecutivo Redbio-L)
- 11:00 hrs. Visita a Minera Pudahuel ( Romilio Espejo)
- 16:30 hrs. Reunión de trabajo (J. Verástegui, L. Gil, otros representantes) y Conclusiones

# DIRECCIONES DE LA INSTITUCIONES A VISITAR

Lunes 8 de Abril

9:00 hrs.

Sr. Aníbal Megge  
Gerente Medio Ambiente  
**SOFOFA**  
Av. Andres Bello 2777 3º Piso, Providencia  
Santiago, Chile  
Teléfono: 56-2-2033100  
Fax : 56-2-2033142

10:30 hrs

Sr. Carl-Heinz Becks  
Director Ejecutivo  
**EuroChile**  
Dirección: Hernando de Aguirre 1549, Providencia  
Santiago, Chile  
Teléfono: 56-2-2049363 - 2049367 - 2049371  
Fax : 56-2-2741511

15:00 hrs

Sra. Margarita D'Etigny  
**Consejo de Innovación Agraria**  
Dirección: Fidel Oteiza 1956, Piso 16  
Teléfono: 3417246  
Fax: 2740849

15:45 hrs

Sr. Enrique D'Etigny  
Presidente  
**CONICYT**  
Canadá 308, Providencia  
Santiago, Chile  
Teléfono : 56-2-2744537  
Fax: 56-2-2234165

16:00 hrs.

Comite Nacional de Biotecnología  
Presidente: Dr. Jorge Allende  
Secretaria Ejecutiva: Sra. Ximena Gómez  
Canadá 308, Providencia  
Santiago, Chile  
Teléfono : 56-2-2744537  
Fax: 56-2-2234165

16:30 hrs.

Sr. Jorge Yutronic  
Presidente  
**FONDEF**  
Bernarda Morin 551 3º Piso, Providencia  
Santiago, Chile  
Teléfono : 2744537  
Fax: 2042216

Martes 9 de Abril

9:00 hrs.

Seminario en Euro-Chile  
Dirección: Hernando de Aguirre 1549, Providencia  
Santiago, Chile  
Teléfono: 56-2-2049363 - 2049367 - 2049371  
Fax : 56-2-2741511

11:30 hrs.

Sr. André Deschemes  
**CIDA/Embajada de Canadá en Santiago**  
Ahumada 11 Piso 10  
Santiago, Chile  
Teléfono: 56-2- 6962256  
Fax: 56-2-6962424

14:00 hrs.

Reunión de Trabajos  
Laboratorio de Bioquímica y Toxicología Ambiental  
Departamento de Bioquímica  
Facultad de Medicina  
Universidad de Chile  
Dirección: Independencia 1027  
Teléfono: 6786068 - 6786061 - 6786413  
Fax: 7356373

Miércoles 10 Abril

9:15 hrs.

Sr. Carlos Muñoz

**INIA**

Fidel Oteiza 1956 Piso 11- 12, Providencia

Santiago, Chile

Teléfono: 2252118

Fax: 2258773

11:30 hrs.

Dr. Ricardo San Martin

**Departamento de Ingeniería Química y Bioprocesos**

**Facultad de Ingeniería**

**Universidad Católica de Chile**

Av. Vicuña Mackena 4860

Campus San Joaquín

Santiago

Teléfono: 6864254

Fax: 6865803

14:00 hrs.

Sr. Arturo Yudelevich

Presidente

**BIOS CHILE**

Av. Marathon 1943, Ñuñoa

Santiago, Chile

Teléfono: 56-2- 2381878

Fax: 56-2- 2394250

16:30 hrs.

Dra. Loreto Holuigui

**Coordinador Nacional RedBio, PUCCH**

**Lab. de Bioquímica**

**Facultad de Ciencias Biológicas**

**Universidad Católica**

Av. Libertador B. O'Higgins # 340

Teléfono: 6862895 - 6862894

Fax: 2225515

Jueves 11 Abril

9:00 hrs.

Sr. Leonel Sierralta  
**CONAMA**  
Obispo Donoso # 6, Providencia  
Santiago, Chile  
Teléfono 56-2- 2405600  
Fax 56-2-2441262

11:00 hrs.

Ceremonia  
**CONICYT**  
Canadá 308, Providencia  
Santiago, Chile  
Teléfono : 56-2-2744537  
Fax: 56-2-2234165

14:00 hrs

Reunión de Trabajos  
Laboratorio de Bioquímica y Toxicología Ambiental  
Departamento de Bioquímica  
Facultad de Medicina  
Universidad de Chile  
Dirección: Independencia 1027  
Teléfono: 6786068 - 6786061 - 6786413  
Fax: 7356373

Viernes 12 de Abril

9:00 hrs.

Sr. Juan Izquierdo  
Secretario Técnico de la RioBio-L  
**FAO**  
Bandera 150 Piso 7  
Santiago, Chile  
Teléfono: 56-2-6991005  
Fax : 56-2-6961124

11: 00 hrs.

Dr. Romilio Espejo  
**Minera Pudahuel**  
Ruta 68

**PROPUESTA AL CENTRO INTERNACIONAL  
DE INVESTIGACIONES PARA EL  
DESARROLLO DE CANADA, PARA LA  
CONSTITUCION DE UN PUNTO FOCAL DE  
CAMBIOTEC EN CHILE**

**Dr. JAVIER VERASTEGUI  
(Consultor CIID)**

**SANTIAGO, CHILE, ABRIL 12 DE 1996**

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## I. INTRODUCCION

Chile con una población de 14 millones de habitantes es el país con la más alta tasa de crecimiento económico en Latinoamérica (7 % anual promedio en los últimos 10 años). En 1995 las exportaciones han superado la barrera de los US\$16.000 millones. Estas exportaciones en los sectores relacionados a recursos naturales se desglosan de la siguiente manera: sector minero, US\$ 5.000 millones, sector forestal US\$ 2.265 millones, sector agrícola US\$ 2.100 millones, sector pesquero US\$ 1.600 millones.

La política económica del país está basada en el libre mercado, lo cual ha generado una conciencia nacional muy competitiva, que asume que el mercado chileno es el mundo entero y que su éxito comercial tiene como fundamento la calidad de sus productos.

El país ha tenido una política de estrechar lazos comerciales a través de la cooperación bilateral y con asociaciones regionales de libre comercio. Está negociando acuerdos con el Sistema Regional Asia - Pacífico, con el Mercosur y la Unión Europea, además de un acuerdo bilateral con Canadá. Se estima que próximamente podría ingresar al NAFTA.

Chile es uno de los países de América Latina con mejores niveles de educación, contando con una amplia base de recursos humanos altamente calificados en áreas científicas y tecnológicas.

El porcentaje del PGB destinado a I & D ha ido incrementando notablemente, en los últimos años desde 0.38 % en 1981 a 0.75 % en 1994. Así mismo, el gasto en I & D ha aumentado hasta 145.000 millones de pesos (US\$360 millones) en 1994. El desglose sectorial de este gasto es: 41% para el sector silvoagropecuario, 26 % para el sector minero, 13% para el sector pesquero y 20% para el sector industrial. El gasto en I & D por habitante es de US\$ 24,7

En 1994 Chile contaba con 6.500 investigadores entre científicos e ingenieros (4.227 con postgrado), lo cual equivale a 1,21 investigadores por cada mil chilenos en edad productiva. Estos investigadores trabajan en las universidades (4.178), en los institutos de investigación (1.258), en empresas (666) y en otros (327).

La producción científica total del país en 1994, alcanzó a 1.220 artículos publicados en revistas especializadas, lo cual representa el 11 % del total de América Latina.



En 1994, en términos de artículos publicados por cada 100 mil habitantes, este indicador alcanzó a 8,8 artículos, colocando la productividad científica de Chile en el primer lugar de América Latina. Le siguen Argentina con 6,9 y Venezuela y Brasil con 3,0 cada uno.

## II. SITUACION DE LA BIOTECNOLOGIA EN CHILE

CHILE, está particularmente dotado para aprovechar los beneficios ofrecidos por la biotecnología. Las aplicaciones que podrían tener un impacto favorable en la economía chilena incluyen: la biolixiviación de minerales, la explotación de recursos marinos y acuícolas, la micropropagación de especies forestales, el cultivo de plantas transgénicas resistentes a plagas, plaguicidas y stress, la manipulación de embriones animales, la producción de vacunas y kits de diagnóstico, la bioremediación, la biodetección de contaminantes, el tratamiento de efluentes urbanos e industriales y el uso de enzimas industriales.

Actualmente Chile dispone en distintas universidades de excelentes grupos de investigación en Biología Molecular e Ingeniería Genética. Entre estas destacan los grupos de: Universidad de Chile, Pontificia Universidad Católica, Universidad Austral de Valdivia, Universidad de Concepción, Universidad Católica de Valparaíso, Universidad de Talca y Universidad de Santiago. Tales grupos están en condiciones de colaborar en el desarrollo de productos biotecnológicos que pueden competir en el mercado internacional

En cuanto al financiamiento de la investigación en biotecnología, este se obtiene de diversos fondos implementados por el estado a los cuales pueden acceder investigadores de universidades, institutos y empresas.

En 1996, en el concurso FONDECYT se aprobaron proyectos en biotecnología por un monto de US\$ 3,6 millones. De estos fondos, el 19% correspondió a Biotecnología Ambiental, el 15% a Genoma Humano, el 13% a Diagnósticos, y el 13% a Biotecnología Vegetal, entre otros. Las universidades principalmente beneficiadas con estos recursos fueron: Pontificia Universidad Católica, Universidad de Concepción, Universidad de

Chile y Universidad Austral de Chile. Aunque en este tipo de concurso no es requerimiento la asociación con las empresas, en los proyectos aprobados

participan 5 empresas.

Por otra parte en los concursos FONDEF, los cuales requieren asociación con empresas, en los dos primeros concursos se aprobaron 29 proyectos por US\$19,6 millones. De estos, 21 proyectos fueron aprobados en el sector agropecuario, 4 en el forestal, 3 en el pesquero y 1 en el sector minero.

Otro instrumento el FONTEC, desde 1991 a Septiembre de 1995 ha financiado 17 proyectos en biotecnología por un monto de US\$ 1,62 millones, en los cuales participan 12 empresas .

Finalmente otra fuente de financiamiento específica para el sector silvoagropecuario es el FIA, fondo que ha aprobado proyectos por US\$ 2,96 millones.

Un estudio desarrollado por EUROCHILE en 1993, mostró que hay un importante inventario de proyectos biotecnológicos. El área de más rápido crecimiento es la Salud Humana y Animal. En salud humana, la investigación se orienta hacia la ingeniería de vacunas (rabia, hepatitis B, meningitis) y kits de diagnóstico (Chagas, sífilis , rotavirus, embarazo, tipo de sangre). En salud animal se están desarrollando vacunas para aves, porcinos, vacunos y peces. En la industria de procesamiento existen prometedores proyectos en separación y purificación de productos naturales a partir de plantas, algas, cortezas, especies marinas, etc. También hay avances notables en bioprocesos tales como biolixiviación, bioremediación, tratamiento de desechos industriales.

En biotecnología marina, Chile claramente tiene liderazgo en acuicultura de peces, moluscos y algas, incluyendo desarrollos en técnicas de diagnóstico, vacunas, hormonas y mejoramiento nutricional. Actualmente se esta comercializando la producción de polímeros de algas (agar, alginatos, carragenanos), quitina y quitosanos, bioadhesivos y proteínas de alta calidad.

Finalmente en agricultura y silvicultura, la industria y las universidades están desarrollando cultivo de tejidos in vitro de plantas y especies forestales.

A nivel empresarial hay signos muy alentadores en el uso comercial de la biotecnología, por ejemplo existe un enorme desarrollo en la biolixiviación de cobre. Se estima que alrededor del 15% de la producción nacional se hace por biolixiviación. Esta tecnología desarrollada por empresas chilenas, ha permitido asociaciones con empresas extranjeras para la explotación de minerales que ha representado una inversión superior a US\$ 600 millones.

En el campo de la salmonicultura, empresas chilenas están desarrollando técnicas de fermentación para producir pigmentos que mejoran la presentación del producto.

En el área forestal, empresas chilenas están desarrollando tecnologías de pulpaje y blanqueamiento de celulosa por bioprocesos, lo cual contribuirá a disminuir notablemente la contaminación química.

### **III. JUSTIFICACION DE UN PUNTO FOCAL DE CAMBIOTEC EN CHILE**

De acuerdo a la situación anteriormente descrita, debido a la enorme disponibilidad de recursos naturales, al excelente nivel de sus recursos humanos y a las necesidades de mantener e incrementar las tasas de crecimiento económico, Chile requiere incorporar tecnología de punta a sus sistemas productivos con el fin de competir con éxito en el mercado internacional.

En tal sentido es indispensable que Chile desarrolle un programa de promoción de la biotecnología comercial en los diversos sectores donde tiene ventajas comparativas, en particular los sectores silvoagropecuario y medio ambiental.

Para este efecto es importante desarrollar programas cooperativos norte-sur y sur-sur. En este sentido la misión y los objetivos de CAMBIOTEC responden a las necesidades actuales de Chile para el desarrollo de la biotecnología aplicada al sector empresarial.

## **IV. PROGRAMA DE ACTIVIDADES**

De acuerdo a los términos de referencia para constituir un punto focal de la iniciativa CAMBIOTEC en Chile, enviados por el Centro Internacional de Investigaciones para el Desarrollo de Canadá (CIID), y a la serie de reuniones sostenidas por el Consultor del CIID con representantes de distintas instituciones chilenas, se ha elaborado el siguiente Programa Preliminar de Actividades:

### **IV.1 Implementar metodologías para establecer prioridades en biotecnología y realizar estudios de impacto en áreas priorizadas.**

- a) Se definirán las áreas prioritarias para el desarrollo de la biotecnología en Chile. Mediante la realización de un estudio de base y su discusión en un taller siguiendo la metodología propuesta por CamBioTec.
- b) Monitoreo de los cambios tecnológicos, ambientales, económicos y políticos que tienen impacto en el desarrollo de la biotecnología en Chile. El propósito es facilitar los ajustes y modificaciones necesarias a las prioridades establecidas.
- c) Se organizará un Taller Nacional sobre Impacto Socio-Económico y Ambiental de la Biotecnología en Chile en las áreas priorizadas

### **IV.2 Desarrollar mecanismos de coordinación nacional y planificación de las actividades del Punto Focal.**

- a) Establecimiento de un sistema nacional de información y coordinación para el desarrollo de la biotecnología dirigida a la empresa.
- b) Diseñar un plan de acción con diferentes instituciones y mecanismos para la ejecución de los términos de referencia.

### **IV.3 Evaluar la inversión pública en biotecnología y su impacto en el desarrollo nacional. Utilizar esta información para diseñar las políticas promocionales que Chile requiere en esta área.**

En coordinación con CONICYT y las otras instituciones participantes el Punto Focal realizará un estudio de la inversión y resultados de la investigación en biotecnología en los últimos 10 años en Chile. Este documento servirá de base para el Taller Nacional de definición de áreas prioritarias que se discute en III.7.b

### **IV.4 Apoyar la formación de recursos humanos y la cooperación en investigación en áreas prioritarias de la biotecnología.**

El punto focal facilitará la localización y traída de expertos canadienses para formación de recursos humanos en las áreas priorizadas. Al mismo tiempo ayudará en el establecimiento de contactos para la cooperación en investigación bilateral.

Para este efecto el Punto Focal utilizará los contactos que tiene CamBioTec con diversas universidades, institutos de investigación e instituciones de financiamiento canadienses y utilizando además los mecanismos nacionales que existieran para tal efecto.

### **IV.5 Identificar potenciales socios chilenos para establecer colaboración en investigación y desarrollo, transferencia de tecnología y joint-ventures en las áreas prioritarias. Compartir esta información con otros puntos focales de CamBioTec.**

- a) Se utilizarán las bases de datos existentes en CONICYT, CONAMA, FONTEC, FIA y FAO sobre investigación y desarrollo. Igualmente en el sector empresarial se utilizará la información existente en EUROCHILE, CORMA, SOFOFA, SONAMI, SNA, Asociación de Salmoneros, FEDEFRUTA, etc.
- b) Se elaborarán perfiles de empresas chilenas conteniendo información sobre productos, comercialización, mercados, necesidades tecnológicas, regulaciones y patentes, de acuerdo a los formatos desarrollados por CamBioTec para fines de intercambio.

- c) Se realizará un intercambio selectivo de perfiles de empresas con los Puntos Focales de los países participantes en el programa.

#### **IV.6 Promover misiones de empresarios chilenos a Canadá y de empresarios canadienses a Chile .**

Para esto se utilizarán mecanismos de financiamiento existentes en Canadá y en Chile.

##### **CHILE**

- Fondo de Investigaciones Agropecuarias (FIA) Ministerio de Agricultura,
- Fondo Nacional de Desarrollo Tecnológico y Productivo (FONTEC),
- Fondos del Sector Empresarial (bajo la coordinación de SOFOFA ó de otras organizaciones empresariales.
- Fondo de Investigaciones Pesqueras (FIPA)

##### **CANADA**

- Agencia Canadiense de Desarrollo Internacional (ACDI),
- Ministerio de Medio Ambiente (Environment -Canadá),
- Ministerio de Agricultura (AG-Canadá),
- Ministerio de Industria (Industry-Canadá)
- Ministerio de Relaciones Exteriores y Comercio Internacional (DFAIT), y otros.

Se considerará la organización de 5 misiones empresariales. Dos en el área de biotecnología ambiental (1 misión de empresarios chilenos a Canadá y 1 misión de empresarios canadienses a Chile), dos en el área silvoagropecuaria (1 misión de empresarios chilenos a Canadá y 1 misión de empresarios canadienses a Chile) y 1 en el área de la biotecnología acuícola (de empresarios canadienses a Chile, con motivo de ExpoPesca, 27- 30 Noviembre, 1996).

La primera misión se está gestionando con el INIA y con el FIA y será de empresarios chilenos del área silvoagropecuaria, para participar en la conferencia mundial AG-BIOTECH 1996 que se desarrollará en Saskatoon, Canadá entre el 11 y 14 de Junio. CamBioTec aprovechará esta oportunidad para organizar una serie de visitas y ruedas de negocios con empresas canadienses.

**IV.7 Identificar nichos específicos de mercado en biotecnología, promover joint-ventures entre empresas e instituciones chilenas, canadienses y latinoamericanas, y apoyarlos en los procesos de negociación.**

Basados en los perfiles de empresas chilenas, canadienses y latinoamericanas, se identificará nichos específicos de mercado para posibles joint-ventures.

El Punto Focal Chile en combinación con los otros puntos focales del programa realizarán la intermediación entre potenciales socios para acuerdos de joint-ventures y transferencia de biotecnología. Esta interfase incluirá el intercambio de información entre empresas, la organización de visitas y ruedas de negocios en áreas específicas de la biotecnología.

En coordinación con el punto focal Canadá, se apoyarán a las empresas en la búsqueda de financiamiento para los procesos de negociación de joint-ventures tales como: estudios de mercados específicos, ensayo de campo de nuevos productos, protección intelectual y cumplimiento de regulaciones. Entre las instituciones que podrían apoyar estas iniciativas están el Fondo CIDA INC de ACIDI (Canadá) y FONTEC (Chile).

**IV.8 Organizar en coordinación con el CIID, seminarios ejecutivos en Chile en áreas prioritarias de la biotecnología. Esta labor incluye el desarrollo de los programas, selección de conferencistas, selección de instituciones auspiciadoras y la obtención de fondos adicionales.**

Se está trabajando en la organización de los siguientes eventos:

- a) Taller Canadá-Chile sobre Biotecnología Ambiental (Octubre 1996): En coordinación con el Punto Focal Canadá y Environment Canadá. El taller estará orientado a:
  - Manejo ambiental sustentable basado en el uso de productos biotecnológicos.
  - Contaminación Atmosférica.
  - Utilización de tecnología limpias.
  - Bioremediación en áreas contaminadas por el sector minero, forestal,

acuícola y agrícola.

La organización local de este evento se realizará en conjunto con las siguientes instituciones: CONAMA, SONAMI, SOFOFA y Ministerio de Minería, INIA, CIA y FIA.

- b) Taller Nacional para definición de Areas Prioritarias en Biotecnología (Mayo, 1997). En este taller participarán las instituciones chilenas del sector de gobierno, académico y empresas. Se invitarán expertos latinoamericanos que han participado en la definición de estas áreas en sus respectivos países. El encuentro será organizado por el Punto Focal en coordinación con el Comité Nacional de Biotecnología de CONICYT, las otras instituciones participantes y el CIID.
- c) Taller Nacional sobre Impacto Socio-económico y Ambiental de la Biotecnología (Noviembre, 1997). En este taller participarán expertos en ciencias sociales y de diferentes áreas de la biotecnología de Chile y del extranjero. El encuentro será organizado por el Punto Focal en coordinación con CIID (Canadá), ISNAR (Holanda), INIA, CIA, FIA, Ministerio de Agricultura, SNA y SOFOFA (Chile).

#### **IV.9 Promover iniciativas para vincular mejor la capacidad científica y tecnológica nacional en biotecnología con los productores y los requerimientos de los mercados.**

Para cumplir este objetivo el Punto Focal realizará las siguientes acciones.

- a) Organizar un Seminario sobre Gestión de la Innovación en Biotecnología dirigido al sector empresarial y académico, con la participación de instituciones especializadas tanto nacionales como internacionales. El encuentro se ha planificado para Septiembre de 1997 y será organizado por el Punto Focal en coordinación con IDRC, Fundación EUROCHILE, FONDEF, FONTEC y SOFOFA.
- b) Implementar en conjunto con CONICYT y Fundación EUROCHILE un boletín electrónico periódico con el fin de promover en Chile el desarrollo de la biotecnología dirigida a empresas y mantener así una estrecha vinculación entre los sectores empresarial y académico del país.

El boletín difundirá información de las empresas e instituciones participantes en el Punto Focal de Chile. Además publicará noticias tecnológicas, políticas y económicas de interés. El Punto Focal de Chile, distribuirá entre sus



asociados el boletín internacional de CamBioTec que se editará en México, con una periodicidad bimensual.

#### **IV.10 En coordinación con el CIID buscar apoyo financiero adicional de fuentes chilenas e internacionales para financiar actividades de CamBioTec, tanto en Chile como en otros países participantes.**

Entre las fuentes chilenas se puede mencionar:

- a) Programas de Cooperación Internacional de CONICYT.
- b) Programa de Promoción de la Transferencia Tecnológica de FONDEF.
- c) Programa de Misiones Empresariales de FONTEC .
- d) Programa de Misiones Empresariales en el Sector Agrícola de FIA.
- e) Programa de Misiones Empresariales en el Sector Pesquero

Entre las fuentes canadienses se puede mencionar:

- a) Fondo de Transferencia Tecnológica para el Cono Sur de ACDI.
- b) Fondo Industrial Cooperation Program de ACDI (CIDA INC).
- c) Fondo International Environmental Management Initiative (IEMI) de Environment-Canada.
- d) Fondo Agricultural International Management Strategy (AIMS) de Agricultural-Canadá.

### **V. PUNTO FOCAL**

El Punto Focal de Chile considerará la participación de todas las entidades del sector público y privado relacionados con el desarrollo de la biotecnología agropecuaria y ambiental que se encuentran activas en el país.

Para facilitar la coordinación entre las instituciones nacionales el Punto Focal estará ubicado en CONICYT.

En forma preliminar se ha estimado conveniente que el Punto Focal funcione con un Coordinador General designado por CONICYT y un Comité Asesor, constituido por representantes de las instituciones participantes. En cuanto a estas instituciones, podrán ser aquellas de carácter sectorial y asociativo que desarrollan actividades en biotecnología en campos de su especialidad.

Entre estas se incluyen en una primera etapa las siguientes con las cuales ya se han establecido contactos y que han manifestado su interés en participar en CamBioTec:

- Fundación EUROCHILE
- CONAMA                    Comisión Nacional Medio Ambiente
- CONAF                    Corporación Nacional Forestal
- INFOR                    Instituto Nacional Forestal
- SOFOFA                  Sociedad Fomento Fabril
- CIA                        Consejo de Investigaciones Agrarias
- INIA                       Instituto Nacional de Investigación Agropecuaria
- FIA                        Fondo de Investigaciones Agrícolas
- IFOP                      Instituto Fomento Pesquero
- BIOS Chile
- Veterquímica
- Minera Pudahuel

En una segunda etapa se contactará a otras instituciones tales como:

- SNA                        Sociedad Nacional de Agricultura
- SONAMI                  Sociedad Nacional de Minería
- Fundación Chile
- FIPA                      Fondo Investigación Pesqueras
- CINDA

## **VI. INFORMACION SOBRE INSTITUCIONES PARTICIPANTES**

### **VI.1 Comisión Nacional de Investigación Científica y Tecnológica (CONICYT)**

Creada en 1967 como una entidad asesora del gobierno, en materias de Ciencia y Tecnología. Entre sus principales objetivos destacan: fomentar y financiar programas y proyectos de investigación Científica y Tecnológica, apoyar la formación de recursos humanos, incentivar el uso de sistemas de información científica, interrelacionar a científicos chilenos con sus homólogos del mundo y promover la divulgación y valoración de la Ciencia y Tecnología.

CONICYT ha establecido un Comité Nacional de Biotecnología que funciona desde el año 1983. Este comité tiene por objetivos:

- a) Promover el desarrollo de la biotecnología en el país.
- b) Estimular el desarrollo de las ciencias y tecnologías relacionadas con la biotecnología.
- c) Promover la elaboración de proyectos e investigaciones interdisciplinarias e interinstitucionales en áreas prioritarias.
- d) Estimular el adiestramiento de jóvenes científicos en áreas de especial relevancia para la biotecnología.
- e) Canalizar los contactos internacionales y regionales en biotecnología.

Entre los mecanismos de promoción de Ciencia y Tecnología, CONICYT ha creado diversos fondos. Entre los principales se encuentran:

#### **VI.1.1 Fondo de Fomento al Desarrollo Científico y Tecnológico del Gobierno de Chile (FONDEF)**

El FONDEF tiene como objetivo fundamental apoyar el aumento de la competitividad de los sectores económico-sociales del país a través del

desarrollo y fortalecimiento del sistema nacional de Ciencia y Tecnología.

Los objetivos específicos del FONDEF son contribuir a:

- a) Aumentar la cantidad y la calidad de la investigación y desarrollo, y de la prestación de servicios científico-tecnológicos, que tengan un impacto económico-social significativo.
- b) Promover una efectiva transferencia tecnológica hacia los sectores económico-sociales relevantes, a través de una mejor articulación de las entidades de investigación y desarrollo y de los proveedores de servicios científico-tecnológicos, con otros agentes de la actividad económica nacional.

En particular, esta articulación se efectuará a través de la promoción de una mayor interacción, colaboración y realización de proyectos conjuntos entre las instituciones de investigación y desarrollo, las empresas u otras organizaciones pertinentes.

En el período 1991 - 1996, este programa ha apoyado 99 innovaciones tecnológicas con una inversión de US\$ 60 millones, se espera que esta inversión retorne al país solo en beneficios directos un total de US\$ 600 millones.

### **VI.1.2 Fondo Nacional de Desarrollo Científico y Tecnológico (FONDECYT)**

Este fondo fue creado en 1982 , ha financiado más de 4.000 proyectos de 1 a 3 años de duración . En la actualidad tienen financiados simultáneamente 1.023 proyectos de investigación elegidos por concurso en base a su excelencia tanto en el área de ciencia como en la de desarrollo científico. El financiamiento en 1995 fue de US\$ 26,4 millones.

### **VI. 2 Fundación EUROCHILE.**

Es una institución privada sin fines de lucro, creada en 1993 por el gobierno de Chile y la Comunidad Europea . Esta institución ha definido dentro de sus áreas de acción a la biotecnología. Los objetivos de EUROCHILE son:

- a) Fomentar, facilitar y apoyar los contactos entre empresas chilenas y de la Comunidad Europea

- b) Organizar, promover y colaborar en la realización de encuentros empresariales.
- c) Propiciar acciones de cooperación entre empresas chilenas y europeas orientadas a su modernización y a aumentar su competitividad.
- d) Promover entre las empresas europeas proyectos propuestos por empresas o entidades chilenas con el objeto de que las empresas europeas jueguen un papel activo en su desarrollo.
- e) Proporcionar a los agentes y empresas europeas interesados información relevante sobre la evolución económica de Chile, legislación y oportunidades de negocios.

EUROCHILE ha definido que su campo de acción no se limita solo a la cooperación con Europa sino que también está interesada en ampliar sus actividades a otros países americanos.

EUROCHILE ha establecido más de 60 perfiles de proyectos en el área de biotecnología, ha organizado ruedas de negocios con empresarios en Europa y en Chile y ha adquirido un reconocido prestigio nacional dentro del sector académico y empresarial.

### **VI.3 SOCIEDAD NACIONAL DE MINERÍA (SONAMI)**

La Sociedad Nacional de Minería es una institución privada, de carácter gremial, que agrupa a los empresarios mineros privados de Chile. Fue fundada en 1883 y es una de las instituciones empresariales más antigua de Latinoamérica.

Los objetivos de la Sociedad Nacional de Minería son:

- a) Trabajar por el fomento y desarrollo de la minería privada.
- b) Velar por el interés común de sus afiliados ante los poderes públicos y la comunidad nacional.
- c) Brindar servicio de apoyo en todas las materias de orden técnico, legal, tributario, laboral, informativo y de negocios que contribuyan al desarrollo de la actividad minera en Chile.

## VI.4 Comisión Nacional del Medio Ambiente (CONAMA).

Creada en Junio de 1990 mediante el Decreto Supremo N° 240 del Ministerio de Bienes Nacionales. En Marzo de 1994 fue promulgada y publicada en el Diario Oficial la Ley N° 19.300, denominada Ley de Bases del Medio Ambiente, la que marcó la culminación del primer período de CONAMA, y se constituyó en la ley marco que ordena y regula tanto la institucionalidad ambiental como las herramientas a utilizar para sentar la temática en el país.

A partir de la publicación de la Ley, CONAMA se transformó en un servicio público descentralizado, con personalidad jurídica y patrimonio propio, encargado de proponer las políticas ambientales del Gobierno, y coordinar y gestionar dentro del aparato público, todas aquellas materias relacionadas con la protección del medio ambiente, entre otras múltiples funciones.

Con la entrada en vigencia de la Ley de Bases del Medio Ambiente, las funciones y atribuciones específicas de CONAMA se definieron en torno a constituirse en el organismo que propone las políticas ambientales del Gobierno y coordina las materias ambientales tanto a nivel nacional, como en sus expresiones regionales, a través de las Comisiones Regionales del Medio Ambiente (COREMAs).

Son funciones principales de la CONAMA: proponer las políticas ambientales del Gobierno; actuar como organismo de consulta, análisis, comunicación y coordinación de las materias relacionada con el Medio Ambiente; administrar el Sistema Nacional de Evaluación de Impacto Ambiental; generar las normas Primarias y Secundarias de Calidad Ambiental y los Programas para su cumplimiento; colaborar en la preparación, aprobación y desarrollo de programas de educación y difusión ambiental tendientes a crear conciencia sobre la protección del medio ambiente, coordinar a los organismos competentes en materias vinculadas con el apoyo internacional a proyectos ambientales y ser contraparte nacional en proyectos ambientales con financiamiento internacional en conjunto con la Agencia de Cooperación Internacional (AGCI); entre otros.

Recientemente CONAMA ha suscrito un Memorándum de Entendimiento con Environment Canadá para promover la cooperación en el campo ambiental entre Canadá y Chile.

## **VI.5 Sociedad de Fomento Fabril (SOFOFA)**

La sociedad de Fomento Fabril es una federación gremial, sin fines de lucro, que reúne a empresas y gremios vinculados al sector industrial chileno. Agrupa a más de 2.000 empresas, 24 asociaciones sectoriales y 7 filiales regionales.

Las diferentes zonas del país están representadas por las Asociaciones Industriales de Arica, Antofagasta, Valparaíso y Aconcagua, Curicó, Talca, Concepción, Malleco y Cautín. Todos estos miembros en conjunto representan el 85% de la actividad industrial de Chile.

La SOFOFA fue fundada el 7 de octubre de 1883. Sus objetivos básicos son promover la generación, progreso, desarrollo de la actividad industrial particular; y la defensa de la libre iniciativa, propiedad privada, libertad de mercados, de precios y de coordinación y apertura al mercado exterior.

Esta institución realiza además estudios y desarrollo industrial y dispone de departamentos de comercio exterior, relaciones internacionales, operaciones y medio ambiente.

## **VI.6 Fondo de Nacional de Desarrollo Tecnológico y Productivo (FONTEC)**

Es un organismo de la Corporación de Fomento de la Producción (CORFO) creado en 1991 para facilitar a las empresas chilenas la adopción de nuevos procesos de gestión, aumentar su productividad y mejorar la calidad de sus productos. Tiene por objetivos promover, orientar, financiar y subvencionar la ejecución de proyectos de innovación tecnológica, de transferencia tecnológica innovativa, de adquisición de infraestructura tecnológica y, en general, fomentar todas las etapas de desarrollo y la fase de escalamiento productivo y comercial de proyectos derivados de un proceso innovador llevado a cabo por empresas productivas de bienes y servicios.

Las líneas de financiamiento de FONTEC, son las siguientes:

- a) Innovación Tecnológica.
- b) Infraestructura Tecnológica
- c) Proyectos de Transferencia Tecnológica Presentados Asociativamente (Misiones Tecnológicas y Consultorías Especializadas).

- d) Entidades de Gestión y Centros de Transferencia Tecnológica.
- e) Estudios de Pre-inversión Para Escalamiento Productivo en Proyectos de Innovación.
- f) Caucciones Solidarias de CORFO para Proyectos con Contenido Innovativo.
- g) Subsidio a la Asistencia Financiera SUAF-FONTEC

Hasta Septiembre de 1995 FONTEC ha financiado 400 proyectos por un monto superior a los US\$ 25 millones los cuales se estima que producirán beneficios por un monto de US\$ 200 millones en áreas muy competitivas a nivel internacional. En el área biotecnológica FONTEC ha financiado 17 proyectos en los cuales participan 12 empresas.

### **VI.7 Instituto Forestal (INFOR)**

Es un organismo estatal de investigación y desarrollo dependiente de la Corporación de Fomento de la Producción (CORFO), que fue establecido en 1961 en razón del importante potencial forestal chileno y del reconocimiento de las necesidades de progreso técnico en las áreas de los recursos humanos, naturales e industriales del sector.

Su mandato es crear y adaptar conocimientos que se apliquen a los procesos productivos; difundir información económica, de recursos y de mercados para aprovechar las potencialidades forestales del país y prestar servicios especializados como apoyo a las gestiones operativas del sector productivo.

Las actividades de investigación propiamente tal se orientan a líneas de trabajo de largo plazo, dirigidas a buscar soluciones en el campo de la producción, teniendo siempre como marco las necesidades de desarrollo integral y armónico del sector en su conjunto.

### **VI.8 Consejo para la Innovación Agraria (CIA)**

Creado en 1994 por Decreto N° 260 del Ministerio de Agricultura. Funciona como comisión asesora del Ministerio de Agricultura, formula propuestas para la definición de políticas y acciones que favorezcan el desarrollo, captación y transferencia de conocimientos científicos y tecnológicos al sector productivo y de gestión del agro y una mayor presencia de los productos y servicios agrarios chilenos en los mercados internacionales.



Entre sus funciones están:

- a) Emitir concepto sobre proyectos de políticas, mecanismos e instrumentos de estímulo a la innovación tecnológica en el sector agrario.
- b) Ayudar a la identificación de las necesidades del sector en materia de desarrollo científico y tecnológico.
- c) Sugerir los instrumentos para una mayor vinculación de los servicios dependientes del Ministerio de Agricultura con el sector productivo.
- d) Pronunciarse sobre el mérito de los proyectos que sometan a su consideración el Ministerio de Agricultura o, por su intermedio, las instituciones del sector agrario.
- e) Recomendar actividades que fortalezcan la capacidad innovadora del sector.
- f) Promover modalidades para vincular mejor la capacidad científica y tecnológica nacional con los productores y los requerimientos de los mercados.
- g) Constituirse en una instancia de debate y análisis permanente de la innovación tecnológica en el sector agrario, pudiendo al efecto invitar a otros personeros o especialistas de los sectores público, privado y académico, a reuniones destinada a estos propósitos.

El consejo está integrado por las siguientes personas:

- a) Un representante del Ministerio de Agricultura, quién lo presidirá
- b) Cinco académicos o investigadores de diferentes Universidades y Centros de Investigación del país, designados por el Ministro de Agricultura.
- c) Un representante de la agricultura familiar, designado por el Ministro de Agricultura.
- d) Un representante de la Federación de Productores de Frutas de Chile (FEDEFRUTA F.G.).
- e) Un representante de la Asociación Nacional de Productores de Semillas A.G.
- f) Un representante de la Asociación Nacional de Exportadores de Frutas A.G.

- g) Un representante de la Federación de Procesadores de Alimentos y Agroindustriales de Chile (FEPACH)
- h) Un representante de la Asociación Nacional de Agricultura (SNA).
- i) Un representante de la Corporación Chilena de la Madera (CORMA).
- j) Un representante de la Comisión Nacional de Investigación Científica y Tecnológica (CONICYT)
- k) Un representante del Instituto de Investigaciones Agropecuarias (INIA)
- l) Un representante del Centro de Información de Recursos Naturales (CIREN).
- m) Un representante de la Fundación Fondo de Investigación Agropecuaria (FIA).
- n) Un representante del Instituto Forestal (INFOR)

## VII. PRESUPUESTO (Dólares Canadienses)

Actividad	IDRC	CONICYT	EUROCHILE	OTROS*	TOTALES
Coordinador Punto Focal					
3.500 CAD x 24 m (22 h/sem)	25.308	--	--	58.692	84.000
1 Profesional Asociado	25.000	--	--	8.600	33.600
1.400 CAD x 24 m (22 h/sem)					
2 Operadores informáticos	--	12.500	12.500	--	25.000
24m 12 h/sem					
Secretaria Ejecutiva	6.480	--	--	6.480	12.960
540 CAD x 24 m x 40 h/sem					
Organización de Seminarios	10.000	5.000	5.000	100.000	120.000
Misiones Empresariales y					
Ruedas de Negocios	--	--	10.000	200.000	210.000
Infraestructura y bases de datos	--	20.000	20.000	--	40.000
Publicaciones y reproducción	10.000	5.000	5.000	20.000	40.000
Gastos de movilidad local	2.000	--	--	--	2.000
Gastos de viajes dentro de Chile	4.000	2.000	--	--	6.000
Comunicaciones	12.000	--	--	--	12.000
Alquiler Oficina Sede Punto Focal	--	6.000	8.000	--	14.000
Gastos Generales y difusión	5.212	2.000	2.000	--	9.212
<b>TOTAL CAD</b>	<b>100.000</b>	<b>52.500</b>	<b>62.500</b>	<b>393.772</b>	<b>608.772</b>

\* CHILE: Empresas Individuales, FONDEF, FONTEC, FIA, CONAMA, SOFOFA, SNA, SONAMI  
 CANADA: Empresas Individuales, ACIDI, Environment Canadá, Agriculture Canadá, Industry Canadá, DFAIT.

## VIII. CRONOGRAMA DE ACTIVIDADES

ACTIVIDAD	TRIMESTRE <sup>1</sup>							
	1	2	3	4	5	6	7	8
Sistema Nacional de Información	*	*	*	*	*	*	*	*
Perfiles de Empresa	*	*	*	*	*	*	*	*
Intercambio de perfiles de empresas	*	*	*	*	*	*	*	*
Misiones de empresarios y R. Negocios	*	**		*		*		
Identificación de nichos de mercados	*	*	*	*	*	*	*	*
Promoción de Joint-Ventures		*	*	*	*	*	*	*
Talleres Nacionales y Binacionales		*		*		*		
Seminarios ejecutivos					*			
Boletín electrónico		*	*	*	*	*	*	*
Formación de recursos humanos	*	*	*	*	*	*	*	*
Cooperación bilateral en I & D	*	*	*	*	*	*	*	*
Obtención de recursos financieros	*	*	*	*	*	*	*	*
Informes de Actividades				*				*

<sup>1</sup> El cronograma considerará el inicio de las actividades del Punto Focal en Julio de 1996

## IX. CURRICULUM VITAE DEL COORDINADOR PROPUESTO

### Dr. Lionel Gil H.

En 1963 se graduó en la Universidad de Chile y al año siguiente ingresó a la Cátedra de Química de la Facultad de Medicina esa casa de estudios. Entre 1969 y 1971 obtuvo las becas Fullbright y Ford para estudios de postgrado en la Universidad de Cornell, EE.UU., donde obtuvo en 1973 el Ph. D. En 1976, apoyado por una Beca DAAD, trabajó en las Universidades de Tübingen y Munich en Alemania, luego de hacerlo posteriormente en calidad de profesor visitante en las Universidades de Texas en Houston y de Surrey en Inglaterra. Es Profesor Titular del Departamento de Bioquímica de la Facultad de Medicina de la Universidad de Chile y del Programa de Postítulo en Gestión Ambiental de la Universidad de Santiago de Chile, realiza docencia de pregrado en Bioquímica en la carrera de Medicina. A nivel de postgrado dicta el curso de Toxicología Ambiental para el Programa de Postgrado en Ciencias Ambientales y Biomedicina

Ha ocupado cargos directivos en la Sociedad de Bioquímica, siendo su presidente en el período 1981-1982. Organizó y fue presidente del Primer Congreso Nacional de Biotecnología realizado en 1989 en Talca. Trabajó entre 1979 y 1985 como asesor científico del Programa de Entrenamiento de Postgrado en Ciencias Biológicas del PNUD/UNESCO. En 1984 participó en diversas reuniones convocadas por organismos internacionales para crear la Red Latinoamericana de Biotecnología, la que actualmente funciona con recursos del PNUD/UNESCO/ ONUDI. Ha sido consultor de Syracuse Research University Corporation, institución en la cual participó en un estudio para la instalación de una industria químico-farmacéutica en la región andina. También ha sido consultor de la Universidad de Talca, de la Fundación Andes y del PNUD. Además ha integrado numerosos comités de la Universidad de Chile, CONICYT y FONDECYT. Es miembro de diferentes Comités de Programas de Postgrado de la Universidad de Chile.

Es miembro del Comité de Simposios de la Unión Internacional de Bioquímica. Asimismo, integra el Comité Nacional de Biotecnología con sede en CONICYT y desde 1976 es Coordinador de los Proyectos de Bioquímica y

de Biotecnología de la OEA. Organizó en 1991 un Simposio Internacional titulado: "Desarrollo de Empresas de Biotecnología en América Latina y el Caribe". En este evento participaron 120 personas de 10 países de Latinoamérica. En mayo de 1995 organizó el Primer Encuentro Latinoamericano de Contaminación de Interiores, en el cual participaron relatores de Argentina, Brasil, Canadá, Costa Rica, Chile, Inglaterra y Estados Unidos.

Es miembro del Comité de Biotecnología de la Fundación EuroChile, del Comité de Medio Ambiente de la Facultad de Medicina de la Universidad de Chile y del Comité de Medio Ambiente del Colegio Médico de Chile.

Fue secretario ejecutivo del IV Encuentro Científico del Medio Ambiente realizado en Valdivia en 1992.

Su investigación ha estado centrada en las áreas de Ciencias Químicas y Biológicas, orientada especialmente a problemas de Bioquímica y Toxicología Ambiental. Es autor de más de 60 publicaciones en revistas nacionales e internacionales y del libro Alternativas Científicas para el Desarrollo Tecnológico de Chile (250 páginas, Editorial Universitaria, 1990). Ha dirigido varias de tesis de Magíster y Doctorado, además de haber presentado en los mismos campos trabajos en distintos congresos de Latinoamérica, Europa, Canadá y Estados Unidos.

Ha estudiado el metabolismo de pesticidas, contaminantes ambientales y fármacos. Actualmente tiene proyectos para investigar los agentes mutagénicos y carcinogénicos presentes en el smog de Santiago y evaluar además los riesgos que éstos constituyen para la salud humana. Estas investigaciones son financiadas por Proyectos de FONDECYT, de la Organización de Estados Americanos, del Consejo Británico y de la Comunidad Europea. Ha organizado numerosos cursos internacionales, teóricos y prácticos, en torno al metabolismo del insecticidas, metabolismo de drogas, biotransformación de contaminantes ambientales, sobre técnicas de HPLC, actividades que han sido financiadas por ICRO, PNUD, UNESCO, OEA y el Consejo Británico.

Santiago, Chile, Abril, 1996

**ANNEX 4:**

**Full resume of Dr. Lionel Gil Hormazábal**

## CURRICULUM VITAE

*Lionel Gil, Ph. D.*

### Información Personal:

Fecha de Nacimiento : 4 de Agosto de 1939  
Lugar de Nacimiento : Santiago, Chile  
Hijos : 3  
Dirección Laboratorio : Departamento de Bioquímica  
Facultad de Medicina  
Universidad de Chile  
P.O. Box 70086 Santiago-7  
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Dirección Domicilio : Neverías 4524  
Las Condes, Santiago-10  
Teléfono: (562) 2071005

### Educación:

- Universidad de Chile, Químico Farmacéutico, 1963
- Cornell University, Ph.D., 1973
- Post-Doctorado, University of Tubingen Wets Germany, 1976

### Posiciones:

Profesor Titular, Departamento de Bioquímica, Facultad de Medicina, Universidad Chile.  
Ex Director, Departamento de Bioquímica, Facultad de Medicina, Universidad Chile, 1977-1991

### Otras Posiciones:

1972 Consultor para Syracuse Research University Corporation. Trabajó en un proyecto relacionado a la Industria Farmacéutica en la Región Andina  
Desde 1979 Consultor Científico: Programa Regional de Entrenamiento de Postgrado hasta 1983 en Ciencias Biológicas en América Latina RLA/78/024. Este fue un programa apoyado por PNUD y UNESCO para reforzar la Cooperación Regional en orden de incrementar el entrenamiento para Graduados en Ciencias Biológicas en 10 países de SudAmérica  
1985-1991 Consultor Científico RELAB. Red Latinoamericana de Ciencias Biológicas.  
1989-1991 Consultor Científico, Universidad de Talca.  
1989-1990 Consultor Fundación Andes.  
1990-1992 Consultor CIPMA (Organización no gubernamental relacionada con estudios del Medio Ambiente en Chile).  
1992-1993 Consultor PNUD. Programa Equipamiento FONDEF  
1994-1995 Consultor Científico, Universidad de Talca  
1995 Consultor. Gas Trasandino. Efecto de Ozono en la Salud Humana  
1976-1995 Coordinador de Proyectos OEA

### Participación en Directorios de Sociedades Científicas:

- Vice-Presidente, Sociedad de Bioquímica de Chile, 1979-1980.
- Presidente Sociedad de Bioquímica de Chile, 1981-1982.
- Past-President Sociedad de Bioquímica de Chile, 1983-1984.



## Participación en Directorios de Fundaciones:

- Miembro del Area de Biotecnología. Fundación EuroChile. 1994-1995

## Comité Científicos:

Miembro, Comité Programa de Doctorado de la Facultad de Ciencias, Universidad de Chile. 1974 - 1991  
Miembro, Comité Biología del Fondo Nacional de Desarrollo Científico y Tecnológico: 1986, 1987, 1988, 1989.  
Miembro, Comité Nacional de Biotecnología. CONICYT 1984-1985, 1987-1991, 1991-1996.  
Miembro, Comité de Biotecnología. Fundación EuroChile 1994-1996  
Miembro, Comité del Medio Ambiente Colegio Médico. 1994-1996  
Secretario Ejecutivo, Comité Nacional de Biotecnología 1986-1987  
Miembro, Comité Simposio. Unión Internacional de Bioquímica 1988-1996  
Miembro, Comité Medio Ambiente. Facultad de Medicina, Universidad de Chile 1994-1996

## Proyectos:

Mi investigación ha sido apoyada por Proyectos de la Organización de Estados Americanos desde 1976. Proyectos de la Universidad de Chile 1974-1989, Fondo Nacional de Desarrollo Científico y Tecnológico (FONDECYT) 1983, 1985, 1987, 1988, 1991, 1994 - 1996 y de La Comunidad Europea, 1994-1996. Todos estos proyectos están relacionados al rol del sistema de monooxigenasas citocromo P-450 en biotransformación de xenobioticos. En los últimos 6 años los proyectos han estado principalmente orientados a estudiar los mecanismos de activación de compuestos precarcinógenos a carcinógenos. Desde 1987 mis proyectos han estado financiados por Fondecyt, OEA, Consejo Británico y Comunidad Europea y se han orientado a la evaluación del problema de contaminación del aire en Santiago de Chile. Mis estudios incluyen: toxicidad, composición química de material particulado del aire de Santiago, así como evaluación del posible riesgo para la salud humana.

## Docencia:

**Pregrado:** Profesor de Cursos de Bioquímica y Química. Facultad de Medicina

**PostGrado:** Profesor de diferentes cursos de Bioquímica en Programa de Magister y Doctorado en la Universidad de Chile.  
Profesor de Toxicología Ambiental en el Programa de Magister en Ciencias Ambientales, Facultad de Medicina, Universidad de Chile  
Profesor de Toxicología Ambiental. Escuela de Ingeniería, Universidad de Santiago.

## Cursos de Postgrado y Simposios Internacionales:

Ha organizado y presentado en los siguientes Cursos y Reuniones Internacionales:

- Organizador: Bases Teóricas y Experimentales de la Cromatografía Líquida de Alta Presión. Curso apoyado por OEA, PNUD/UNESCO CHI 84/024. Profesores de: Argentina, Brasil, USA. Estudiantes de Argentina (3) Brasil (2), Perú (1). Enero 1985. 2 semanas.
- Organizador: Genetic Engineering Techniques. Applications in the studies of Drug and Environmental Pollutants biotransformation. Curso apoyado por el Consejo Británico y OEA. Septiembre 20-29, 1989.
- Organizador: Chemical Carcinogenesis and Toxicity Mechanisms. Curso apoyado por Consejo Británico y OEA. Marzo 18-27, 1991.

**Simposio Internacional:**

- Organizador: Desarrollo de Empresas de Biotecnología en América Latina. Apoyados por SELA, OEA, Consejo Británico y Fundación Andes. Asistencia 120 personas de diferentes países de Latinoamérica. Santiago y Viña del Mar, Abril 16-18. 1991.
- Organizador: Primer Encuentro Latinoamericano de Contaminación de Interiores. Santiago, Chile Mayo de 1995. Participantes: Drs. María Alfaro (Costa Rica), Ivan Gee (Imperial College of Science, England), Alan Hedge (Cornell University, USA), John Hoskins (University of Liecester, England), Steve Hruzey (University of Alberta, Canada), Joallen Lewtas (EPA, USA), Antonio Miguel (University of Sao Paulo, Brasil), Renato Miranda (Cámara Chilena de la Construcción, Chile) y Lionel Gil (Universidad de Chile, Chile). Asistieron 100 profesionales.

**Ha organizado los siguientes Seminarios y Reuniones Nacionales:**

- Reunión Anual de la Sociedad de Bioquímica de Chile 1981 y 1982.
- Primera Reunión Anual de Biotecnología, Talca, 1989.
- Secretario Ejecutivo IV Encuentro Chileno del Ambiente, Valdivia, Mayo 1992. Asistieron 800 personas.
- Organizador: Air Pollution, is there any risk for human health Participants: Drs. John Skenkman (USA), Gordon Gibson, Cliff Elcombe (Inglaterra) y Pablo Daud (Chile). Facultad de Medicina, Universidad de Chile, Santiago, 21 de Noviembre 1994.
- Organizador: Air Pollution, is there any risk for human health. Participants: Drs. John Skenkman (USA), Gordon Gibson, Cliff Elcombe (Inglaterra) and Lionel Gil. XXXVII Reunión Anual Sociedad de Biología de Chile en el Simposio: Contaminación Ambiental. ¿Un riesgo para la salud humana? 22 de Noviembre 1994. Puyehue, 23-26 de Noviembre, 1994.

**Publicaciones:**

- "Utilización de algas y residuos de las industrias de harina de pescado en la obtención de Riboflavina por fermentación en profundidad". D.L. Gil, Anales de la Facultad de Química y Farmacia 15, 152 (1963).
- "Biochemical studies on Insecticide resistance in musca domestica I". L. Gil, B.C. Fine, M.L. Dinamarca, I. Balazs and M. Agosin. Information Circular on Insecticide Resistance, Insect Behaviour and Vector Genetics World Health Organization 60, 9 (1967).
- "Biochemical studies on Insecticides resistance in Musca domestica II". D.L. Gil, B.C. Fine, M.L. Dinamarca, I. Balazs, J.R. Busvine and M. Agosin. Ent. Exp. Appl. 11, 15-29 (1968).
- "Some properties of the microsomal system metabolizing DDT in Triatoma Infestans". M. Agosin, N. Scaramelly, D.L. Gil and M.E. Letelier. Comparative Biochemistry and Physiology 29, 785-793 (1969).
- "Structure activity relationship of 1,2,3-benzothiadiazoles insecticide synergists". Ph.D. Thesis Cornell University (1973).
- "Structure activity relationships of 1,2,3-benzothiadiazoles insecticide synergist". L.Gil, C.F. Wilkinson. Sci. Eng. Part B 34, 3143 (1974).
- "Enzyme induction by Phenobarbital in the Madagascar cockroach. Gromphadorhina Portentosa". D.L. Gil, H.A. Rose, R.S.H. Yang and C.F. Wilkinson. Comparative Biochemistry and Physiology 478, 657 (1974).
- "Los 1,2,3-benzothiadiazoles. Un nuevo tipo de compuestos que actúan inhibiendo el transporte de electrones en mitocondrias". D.L. Gil, J. Ferreira y J. Pedemonte. Acta Fisiológica Latinoamericana, 25, Suppl. 4 (1975).
- "Structure activity relationship of 1,2,3-benzothiadiazoles as Carbaryl synergists in Musca domestica". D.L. Gil and C.F. Wilkinson. Pesticide Biochemistry and Physiology 6, 338-349 (1976).

- "Structure activity relationships of 1,2,3-benzothiadiazoles as inhibitors of the mixed function oxidases". D.L. Gil and C.F. Wilkinson. *Pesticide Biochemistry and Physiology* 7, 183-193 (1977).
- "Incubation of C-14-Trichloroethylene vapor with rat liver microsomes: uptake of radioactivity and covalent protein binding of metabolites". H.M. Bolt, A. Buchter, L. Wolonwsky, D.L. Gil and W. Bolt. *International Archives of Occupational and Environmental Health*, 39, 103-111 (1977).
- "The 1,2,3-benzothiadiazole. A new type of compounds acting on coupling site I in rat liver mitochondria". D.L. Gil, B. Reynafarge and J. Ferreira. *Xenobiotica* 10, 7-15 (1980).
- "Alterations in mouse liver monooxygenases by benzothiadiazoles". Pedemonte, J., Olate, J., Cervantes, P., Oberti, C. and D.L. Gil. *Biochemical Pharmacology* 30, 1483-1495 (1981).
- "The effect of benzo(a)pyrene on DNA synthesis and DNA polymerase Activity of rat liver mitochondria". Salazar, I., Tarrago-Litvak, L., Gil, L., Litvak, S. *FEBS Letters* 138, 45-49 (1982).
- "Modulation of rat liver aryl hydrocarbon benzo(a)pyrene hydroxylase by nutritional effect". Salazar, I., Litvak, S. and L. Gil. *Journal of Toxicology and Environmental Health*, 11, 519-533 (1983).
- "La Bioquímica en América del Sur y España". Allende, J.E. y D.L. Gil. Editores: Directorio de Investigadores en Bioquímica, Instituto de Cooperación Iberoamericana, Madrid (1983).
- "Nutritional effect on mitochondrial bioenergetics. I. Alterations in oxidative phosphorylation by rat liver mitochondria". Ferreira, J. and L. Gil. *Biochemical Journal* 218, 61-67 (1984).
- "A simple, reliable and rapid HPLC method to separate and quantify androstenedione, testosterone and hydroxy-testosterones". Mancilla, J. and L. Gil. *Analytical Letters*, 17, 873-886 (1984).
- "Effects of guanethidine on electron transport and proton movements in rat heart, brain and liver mitochondria". Ferreira, J., Gil, L., Stutzin, A. and Orrego, F. *Biochem. Pharmacol.* 34, 2507-2512 (1985).
- "In vivo and in vitro inhibition of rat liver nuclear DNA polymerases by benzo(a)pyrene". Salazar, I., Gil, L., Litvak, S. and Tarrago-Litvak, L. *Biochemical Pharmacology*, 34, 755-762 (1985).
- "The locus of inhibition of NADPH by benzothiadiazoles in beef heart submitochondrial particles". Ferreira, J., Wilkinson, C. and Gil, L. *Biochemistry International*, 12, 447-459 (1986).
- "Use of a new HPLC Method in rat liver microsomal testosterone monooxygenation and its application to study the sex dependent expression of several hydroxylases". L. Gil, M. Orellana, J. Mancilla, J. Garcia, H. Vasquez. *Analytical Letters*, 19, 2261-2275 (1986).
- "Nutritional effects on mitochondrial bioenergetics II. Alterations in  $Ca^{2+}$  uptake by rat liver mitochondria". J. Ferreira and L. Gil. *Biochemistry International*, 15, 95-109 (1987).
- "Nutritional related alterations on liver microsomal testosterone hydroxylases". L. Gil, M. Orellana, H. Vasquez and M. Silva. *International Journal of Andrology* 11, 339-348 (1988).
- "Inhibitors of cytochrome P-450 dependent arachidonic acid metabolism". J. Capdevila, L. Gil, M. Orellana, J. Lawrence, I.M. Marnett, P. Yadagiri, J.R. Falck. *Arch. Biochem. Biophys.* 261 (2), 257-263 (1988).
- "Purification and characterization of liver cytochrome P-446 isolated from proteins energy malnourished rats". L. Gil, H. Vásquez, M. Orellana, J. Selkirk, F. Wold and H. Strobel. *Molecular and Cellular Biochemistry*, 79, 5-16, 1988.
- "Role of Cytochrome P-450 in the activation of chemical carcinogens". L. Gil, I. Salazar, H. Vasquez and M. Lara. *Arch. Biol. Med. Exp.* 21, 135-143, 1988.
- "Nutritionally related alterations in the regioespecificity of cytochrome P-450 oxidations of endogenous substrates". L. Gil, M. Silva, M. Orellana, J. Capdevila. In *Biochemistry and Biophysics of Cytochrome P-450*. Pag. 862-865 Eds. Taylors and Francis, 1989.

- "Nutritionally triggered alterations in the regioespecificity of arachidonic acid hydroxylation by rat liver microsomal cytochrome P-450". M. Orellana, E. Valdés, J. Capdevila and L. Gil. *Arch. Biochem. Biophys.* 274, 251-258, 1989.
- "A novel isocratic HPLC method to separate and quantify acetanilide and its hydroxy aromatic derivatives: 2-, 3- and 4- hydroxyacetanilide (paracetamol or acetaminophen)". J. Mancilla, E. Valdés and L. Gil. *European Journal of Drug Metabolism and Pharmacokinetics* 14 (3), 241-244, 1989.
- "Flumecinol a novel inducer of testosterone 16 alpha hydroxylation in rat liver". M. Silva and L. Gil. *Xenobiotica* 20, 689-697, 1990.
- "Stereo and regioespecific hydroxylation of androstenedione by liver microsomes from rats in different nutritional status". L. Gil, M. Orellana and E. Valdés. In: *Drug Metabolizing Enzymes: Genetics, Regulation and Toxicology*. Eds. M.I. Sundberg, J.A. Gustavsson and S. Orrenius. (1990) page 66.
- "Financiamiento de la investigación en Chile en Biotecnología y en otras áreas relacionadas con el sector productivo". L. Gil, A. White and E. Cáceres. *Arch. Biol. Med. Exp.* 23, 77-87, 1990.
- "Alternativas Científicas para el Desarrollo Tecnológico de Chile. Antecedentes para la definición de áreas prioritarias". L. Gil. Editorial Universitaria S.A., 250 pp. 1990.
- "Riesgos para la salud humana por la exposición a contaminantes de alta toxicidad en el aire de Santiago". L. Gil, M. Adonis, M. Silva, L. Quiñones and I. Salazar. *Ambiente y Desarrollo*, 64-70, Agosto 1991.
- "Genotoxicidad de extractos orgánicos obtenidos del material particulado del aire de Santiago de Chile". L. Gil, M. Adonis, M. Silva, H. Vasquez and L. Quiñones. *Revista Chilena de Enfermedades Respiratorias*, Vol. 7, N° 4: 216-222, Octubre-Diciembre 1991.
- "Daño cromosómico en el cariotipo humano provocado por agentes carcinogénicos del aire de Santiago". M. Silva, V. Daher, M. Adonis y L. Gil. *Revista Chilena de Cancerología*, Vol. 2: 31-35, 1992.
- "Changes on rat liver monooxygenases by administration of extracts from urban air particulates". L. Gil, I. Salazar, L. Quiñones, C. Irrrazabal, G. Gibson and M. Adonis. *Journal of Basic and Clinical Physiology & Pharmacology*, 3, 291, 1992.
- "Mutagenicity of organic extracts from Santiago (Chile) airborne particulate matter". M. Adonis and L. Gil. *Mutation Research*, 292: 51-61, 1993.
- "Efecto de Hidrocarburos Aromáticos Policíclicos y de extractos del material particulado del aire en la síntesis de DNA y en el sistema de monooxigenasas nuclear de hígado de rata. C. Irrrazabal y L. Gil. *Revista Chilena de Cancerología*, Vol. 1(3) 72-79, 1993.
- "Niveles de los principales contaminantes atmosféricos regulados en Santiago de Chile. Ciudad de México y ciudades de Estados Unidos". L. Gil, C. Irrrazabal, P. Daud y M. Polo Peña. *Ambiente y Desarrollo*, Vol. 9:74-79, 1993.
- "Áreas Prioritarias para el Desarrollo Científico Tecnológico de Chile y la Importancia de la Relación Empresa Universidad". L. Gil y A. White. Taller de Expertos sobre Comercialización de los Resultados de Investigación y Desarrollo en América Latina. Conferencia de las Naciones Unidas sobre Comercio y Desarrollo. Universidad y Empresa en un nuevo escenario competitivo. 1993, p. 135-149. Publicación ONUDI.
- "Induction of rat hepatic Cytochrome P-450 IA 1 isoenzyme by organic extract from airborne particulate matter". L. Quiñones-Sepúlveda and L. Gil. *Xenobiotica* 25:81-89, 1995.
- "Contaminación del aire en espacios interiores. El caso del centro de Santiago (Chile). M. Adonis, D. Cáceres, G. Moreno, Gil, L. *Ambiente y Desarrollo*, Vol.11(1): 79-89, Marzo 1995.
- "Influencia de la contaminación atmosférica en la calidad del aire de interiores. El caso de Santiago (Chile). Gil, L., M. Adonis, D. Cáceres, G. Moreno. *Revista Médica de Chile*, 123: 411-425, 1995.
- "Air pollution in Santiago of Chile: Polycyclic Aromatic Hydrocarbons levels and mutagenic activities of organic extracts from airborne particles". L. Gil and M. Adonis. In *Organic Volatil Compounds in the Environment*. R.Perry and J.J. Knight, Eds. page. 139-154, 1995 ISBN 3-906470-05-9.

- "Modulation of the Hepatic Antioxidant Defense System by Air Pollutants from Urban Areas". Fuentes, O.R., A. Lastra, M. Adonis and L. Gil. *Ciência e Cultura* (En prensa, 1996).
- "Polycyclic Aromatic Hydrocarbons Levels and Mutagenic Activities of Organic Extracts from Airborne Particles in Santiago of Chile". Adonis M. and L. Gil. *Indoor+Built Environment*. (En prensa, 1996).
- "Estrategias de Bioseguridad para la Industria". L. Gil and M. Rodriguez. Libro: Reflexiones sobre el Desarrollo de la Biotecnología en Europa y América Latina. Editado por SELA. (En Prensa).

### Presentaciones por Invitación en Universidades e Instituciones Extranjeras

Estas conferencias han sido dadas en diferentes Universidades e Instituciones de Investigación: University of Syracuse, 1973; University of California, Berkeley, 1973; University of California, Riverside, 1973; Universidad de Rosario, Argentina, 1975; Toxikologisches Institut der Universität Tübingen, March 1976; Institut GSF München, May 1976; Shell Research Limited, Woodstock Agricultural Research Centre, Sittingbourne, Kent, June, 1976; Physiologisch Chemisches Institut der Universität des Saarlandes, May 1976; Dept. of Physiological-Chemistry School of Medicine, Johns Hopkins University, Baltimore, 1981; Department of Biochemistry of Texas Health Science Center at Houston, 1984. Department of Environmental Sciences, University of Newcastle, England, May 1994.

### Asistencia por Invitación a Reuniones Técnicas:

- Coordinadores de Proyectos Multinacionales O.A.S. Buenos Aires, Argentina, 1978 O.E.A.
- Meetings of The Regional Council of Project RLA/78/024 PNUD/UNESCO: Lima, Perú, 1980  
Caracas, Venezuela, 1981  
Montevideo, Uruguay, 1982  
Asunción, Paraguay, 1982  
Río de Janeiro, Brasil, 1985
- Reunión de Biotecnología CEPAL/UNESCO, Montevideo, Uruguay, November 1983
- Reunión de Biotecnología, CYTED-D, Río de Janeiro, Brasil, January 1984.
- Reunión PNUD/UNESCO/UNIDO para la creación de la Red Latinoamericana de Biotecnología, Abril, 1984, La Plata, Argentina.
- Reunión de Coordinadores de Proyectos O.A.S., Washington, Diciembre, 1989.
- Reunión de Biotecnología, Río de Janeiro, Octubre, 1989.
- Reunión de Coordinadores de proyectos de Biotecnología, O.E.A., Montevideo, Octubre 1991.
- Taller de Expertos y Coordinación: Universidad y Empresa en un Escenario Competitivo. Universidad de Buenos Aires, 17 al 19 de Marzo 1993. Patrocinado por UNCTAD, PNUD/TCDC.
- Reunión de Expertos de la Red Multimodal de Vinculación y Desarrollo Biotecnológico (REVYDET) Ciudad de México, 28 al 31 de Marzo de 1993. Patrocinado por Programa CYTED.
- Estudio y defensa de los riesgos naturales e inducidos en los grandes núcleos urbanos de América Latina, presentado en Simposio Internacional, México 30 de Junio al 6 de Julio 1993.
- Reunión de Biotecnología, IDRC, Buenos Aires 5 al 9 de Octubre 1993.
- Centro Internacional Estudios Superiores en Comunicación para Latinoamérica, Quito, Ecuador, 26-27 Octubre de 1993.
- Reunión de Expertos para formalizar el Sistema Interamericano de Información en Biotecnología y Tecnología de Alimentos de la O.E.A., Ciudad de Guatemala, 8-11 Noviembre 1993.
- Reunión de Coordinadores de Proyectos de Biotecnología y Tecnología de Alimentos de la OEA, Santiago, Chile, 12-15 de Noviembre 1993.

- Secretaría de Ciencia y Tecnología, Presidencia de la Nación, República Argentina. Buenos Aires, 3 Diciembre 1993.
- Reunión de Informática para Coordinadores de proyectos de Biotecnología O.E.A., Ciudad de Guatemala. Noviembre 1993.
- Seminars on Conflict Environmental Science. Policy and Legislation. Centre for Environmental Control and Waste Management. Imperial College. Inglaterra. 5-7 Septiembre 1994.
- Taller Internacional de Evaluación y Manejo de Riesgos Ambientales. Organización Panamericana de la Salud. OMS. EPA. 14-18 Marzo 1994. Concepción, Chile.
- Taller Transferencia de Información en Biotecnología, EUROCHILE, 25 de Marzo 1994 "Intalación REVDYT".
- Legislación y Gestión para la Biotecnología en América Latina y El Caribe. Reunión de Biotecnología. Bogotá, Colombia, 26 al 28 de Abril 1994.
- Reunión de Coordinación de Proyectos Comunidad Europea, Inglaterra 2-13 de Mayo 1994.
- II Feria Congreso Latinoamericana de Biotecnología. I Congreso Argentino. BIOLATINA. Buenos Aires 6-8 de Junio 1994.
- Seminars on Conflict Environmental Science. Policy and Legislation. Centre for Environmental Control and Waste Management. Imperial College. Inglaterra. 5-7 Septiembre 1994.
- Workshop Using integrated assessment techniques in decision-making: Global climate change mitigation. UNESCO/IAI, CEPAL. Santiago, Chile. 20-23 de Septiembre 1994.
- Symposium on Health Assessment for Environmental Decision Making. Imperial College. London, England. Marzo, 1995
- Reunión de Contaminación Ambiental y su relación con la Salud Humana. Copiapó, Chile. 12 - 13 de Julio. 1995. Organizada por el Colegio Médico de Chile.
- Reuniao Conjunta REVDYDET-Subprograma XVI. Sao Paulo, Brasil. 20 - 22 de Julio. 1995.
- Seminario de Biotecnología en Chile. EUROCHILE. Hotel Plaza San Francisco Kempinski. 4 de Octubre de 1995.
- Second International Conference - Volatile Organic Compounds to be held at the Royal College of Physicians. London, England. 7 - 9 Noviembre, 1995.
- Mesa Redonda: "Combustible y Medio Ambiente". Quito. Ecuador. 23-24 de Noviembre. 1995.
- North-South America Conference on Biotechnology Cobiotech- Instituto de Biotecnología / UNAM. Cuernavaca. México, 26 - 29 de Noviembre, 1995.

**Becas :**

- Cornell University, Ithaca, New York, U.S.A., Ph. D. studies 1969 - 1971.
- Ford Foundation, Cornell University, U.S.A., Ph.D. studies 1971 - 1973.
- Fullbright Foundation Travel Fellowship 1969 - 1973.
- OEA. Lima, Perú. December, 1973 (1 month).
- UNESCO. University of Buenos Aires, Argentina, 1975 (1 month).
- DAAD. West Germany, 1976
- American Institute of Nutrition. Travel Fellowship to attend to the Western Hemisphere Nutrition Congress, Quebec .1977

**Grupo de Investigación y Facilidades del Laboratorio:**

El Laboratorio de Bioquímica y Toxicología Ambiental encabezado por el Dr. Lionel Gil, tiene un área de 200 m<sup>2</sup> está equipado por diversos sistemas de HPLC con diferentes tipos de detectores, diode array; detector radioactivo Berthold, espectrofotómetros, microscopios, campana de flujo laminar y bioseguridad, diversos sistema de electroforesis, sistema de extracción, evaporadores rotatorios, computadores e incubadores con calor seco y atmosfera controlada. El grupo de investigación incluye 3 estudiantes de doctorado, y 1 estudiante de Master.

**ANNEX 5:            Schedule of Activities in Brazil**



## PROGRAMAÇÃO DA VISITA DO DR. JAVIER VERÁSTEGUI

Coordenador da CamBioTec para a América Latina

Período de 15 à 19 de abril de 1996

Segunda-feira - 15-04-1996

- 9:00 horas            Visita ao Dr. Afonso Celso Candeira Valois  
                          Chefe Geral do CENARGEN
- 9:20 horas            Visita ao Dr. Eduardo Vilela Morales  
                          Chefe de Recursos Genéticos
- 9:30 horas            Visita aos laboratórios de Biotecnologia do CENARGEN  
                          Dr. João Batista Tavares - ACB  
                          Dr. Elíbio Rech-ARI  
                          Dr. Assis Roberto de Bem-ARI
- 14:00 horas            Seminário sobre a CamBioTec - Dr. Javier Verástegui  
                          Auditório do CENARGEN
- 16:30 horas            Reunião com o Dr. Richard Smith  
                          Conselheiro - Representante no Brasil para a Agência Canadense de  
                          Desenvolvimento Internacional - Embaixada do Canadá

Terça-feira - 16-4-1996

- 08:30 horas            Reunião com o Dr. F. Reifschneider - Chefe da Assessoria de  
                          Cooperação Internacional-ACI-EMBRAPA/Sede  
                          Dr. A. Dall'agnol-Chefe do Departamento de Programação  
                          Econômica e Desenvolvimento Comercial - DEC - Embrapa  
                          Dra. Marisa Barbosa - Chefe da SEA/Embrapa
- 10:30 horas            Reunião com o Dr. Sebastião Saldanha Neto - Coordenador do  
                          Departamento de Pesca e Aquicultura do IBAMA
- 14:00 horas            Reunião com a Dra. Eliana M. G. Fontes - Secretária Executiva da  
                          Comissão Nacional de Biossegurança - ~~CENARGEN~~



15:00 horas Reunião com o grupo de trabalho da CamBioTec no CENARGEN  
Dra. Damares C. Monte Neshich  
Dr. Mauro Carneiro  
Dra. Marilda Prudente Faria  
Dr. José Francisco Bezerra Mendonça  
Representantes do DEC e SEA

Quarta-feira - 17-4-1996

9:00 horas Reunião com o Dr. Lourival do Carmo Mônaco  
Presidente da FINEP

11:00 horas Reunião com o Dr. ~~Guilherme Brandão~~  
Superintendente do Desenvolvimento e Articulação Tecnológica -  
CNPq

14:00 horas Reunião com o grupo de trabalho da CamBioTec no CENARGEN  
Dra. Damares C. Monte Neshich  
Dr. Mauro Carneiro  
Dra. Marilda Prudente Faria  
Dr. José Francisco Bezerra Mendonça  
Representantes do DEC e SEA

16:00 horas Sessão de trabalho no CENARGEN

Quinta-feira - 18-4-1996

9:00 horas Discussões e conclusões finais no CENARGEN

14:00 horas Conclusão do Relatório de Visita

Sexta-feira - 19-04-1996

9:00 horas Visita a Fundação Bio-Rio e ABRABI - Rio de Janeiro

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## ANNEX 7: Material collected during the Mission \*

### From Chile

- *Indicadores Científicos y Tecnológicos 1995*, CONICYT, Santiago, Diciembre 1995.
- *Antecedentes y Directrices para el Programa Nacional de Biotecnología Agropecuaria y Forestal*, Consejo para la Innovación Agraria - INIA, Santiago, Octubre 1995.
- *Estudio Prospectivo sobre Oportunidades y Requerimientos Tecnológicos para el Desarrollo de la Pesca y Acuicultura*, FONDEF - CONICYT, Santiago 1995.
- *Instituto de Investigaciones Agropecuarias (INIA)*, a kit of promotional material.
- *FONTEC: 100 Proyectos Innovadores*, 1er. Compendio, CORFO, Santiago 1995.
- *FONTEC: 17 Proyectos en Biotecnología*, kit de perfiles, FONTEC, Santiago 1995.
- *EuroChile*, 6 Profiles of Chilean R&D & Biotech Firms looking for Partners in Canada, 1996.
- *Natural Response S.A. - High Technology Plant Extracts*, techno-commercial paper, Santiago 1995.
- *Sociedad Minera Pudahuel: La Tecnología de SMP-TEC en Síntesis*, kit of 9 technical papers on copper bioleaching and 2 pamphlets, Santiago 1996.
- *BIOS CHILE Ingeniería Genética S.A.*, promotional kit on the firm and its bioproducts & bioservices.

### From Brazil

- *National Indicators & Federal Expenditures on S&T: 1980-1994*, Ministry of S&T, Brasilia 1995.
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- Damares Castro M., *Biotechnology for Agriculture and Agro-Industry in Embrapa/CENARGEN*, CENARGEN/Embrapa, Brasilia 1995.
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- Maria J. Amstalden Sampaio, *Biosafety Regulations in Latin America*, AAAS Annual Meeting, 1995.
- Maria J. Amstalden Sampaio, *Biosafety Regulations in Brazil*, Embrapa/CENARGEN, Brasilia 1995.
- Elibio Rech et col., *Biostatic mediated gene expression in cattle tissues in vivo*, Brazilian Journal of Medical & Biological Research (in press).
- Elibio Rech et col., *Inheritance of foreign genes in transgenic bean (*Phaseolus vulgaris* L.) via particle bombardment*, Theoretical & Applied Genetics (in press).
- *Informe Bio-Rio*, number 9, April 1996.
- *BIO RIO*, a kit of promotional material.
- *VITROGEN - Biotechnology at your service*, a promotional paper about this micropropagation firm.
- *BIOMINAS*, two promotional kits of Fundação Biominas including profiles of member firms.
- *O que é SEBRAE*, descriptive brochure of SEBRAE.
- *Gestão Ambiental*, a publication funded by SEBRAE, IBAMA and Instituto Herbert Levy, issue of April 10, 1996, Rio de Janeiro.

\* Available at CIB's Library