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UNITED NATIONS INDUSTRIAL ORGANIZATION

PROJECT PROPOSAL

PART A - BASIC DATA

COUNTRY : Korea/Czechoslovakia
PROJECT NUMBER :
PROJECT TITLE : "Cell Adhesion on Polymer Surfaces":
Twinning Agreement between the Korea
Research Institute of Chemical
Technology (KRICT), Daejeon, Korea and
Research Institute for Rheumatic Disease
(RIRD), Prague, Czechoslovakia

SCHEDULED START : March, 1990
SCHEDULED COMPLETION : Feb., 1991 with possibility of extension
ORIGIN AND DATE OF
OFFICIAL REQUEST : Aug., 1989 KRICT and RIRD
GOVERNMENT COUNTER-
PART AGENCIES :
UNIDO CONTRIBUTION : US \$ 20,000
GOVERNMENT CONTRIBUTION : Korea (US \$ 10,000) and Czechoslovakia
(US \$ 10,000)
CURRENCY REQUIRED FOR
UNIDO INPUT : US \$ 20,000
CONVERTIBLE : US \$ 20,000
OTHER :
UNIDO SUBSTANTIVE BACK-
STOPPING SECTION :
PROGRAMME COMPONENT CODE :
PROPOSAL SUBMITTED BY : KRICT and RIRD
DATE OF SUBMISSION :

PART B - NARRATIVE

1. Background and Justification

Cell adhesion on polymer surfaces is a very important biotechnology with direct applications to artificial organs including heart valve, vascular graft, and dental or orthopedic prosthesis being envisaged. The cell adhesion on polymer surfaces is also very important in cultivating supports for cell or tissue cultures.

One of the major difficulties in biomedical prosthesis is to solve or minimize fixation problems in the body; the surfaces of the prosthesis must be cell (tissue)-compatible. Another problem is to reduce blood clotting on the surface. The blood constituents such as proteins and platelets rapidly adsorb or adhere on the surface of prosthesis resulting in thrombosis. The thrombosis can be prevented or minimized by properly lining selected cells on the surface of the prosthesis.

In general, cells are not readily adhered or grown on biomedical polymer surfaces. Thus, we should either modify surfaces of the polymers or synthesize special polymers to be suitable for cell adhesion. KRICT(Korea) has compiled experiences on the techniques of surface modification. It has modified surfaces of polyethylene, polystyrene and polyester, to improve cell-compatibility. For surface modification of the polymers, it has applied various surface treatment methods: physicochemical oxidation methods such as plasma discharge, corona discharge, sulfuric acid and chloric acid treatments, and biological methods such as adsorption of blood. Plasma protein, serum and fibronectin onto the polymer surfaces. The treated polymer surfaces have been characterized by contact angle measurements, ESCA, ATR-IR, and SEM. In addition, various cells have been cultured on the surface-modified polymers.

RIRD(Czechoslovakia), on the other hand, has been interested in synthesizing several polymeric composites supporting cell adhesion and proliferation. Biological function evaluation of such materials on cell cultures was also conducted.

With these expertises gained in each country, we believe we are in a strong position to conduct a joint research program aimed at producing an effective cell adhering polymer materials.

KRICT(Korea) will take care for the surface modification of existing polymer materials and RIRD(Czechoslovakia) will synthesize new HEMA/methacrylate copolymers capable of supporting cell adhesion. Cell adhesion studies will be performed by both groups using several cell lines and the informations coming-out will be exchanged. Data analysis will also be performed by both groups. It is the capabilities of both groups and will lead to optimum materials for cell adhesion applications.

2. Special Consideration

This project is to be conducted in co-operation the two research institutes of Korea (KRICT) and Czechoslovakia (RIRD) by sharing experances and facilities to obtain mutual benefits for both groups or countries. Thus, it will be necessary for the experts in charge on this joint project to work in the group of counter part for some time period to share informations and experances.

3. Objectives

The main objective of this project is to understand the basic behavior of cell adhesion on polymer surfaces and develop optimum materials for specific cell adhesion applications on the basis of sharing experiences and information between KRICT and RIRD. For this, KRICT will perform surface modification of polymer materials to be suitable for cell adhesion and growth, and RIRD will perform chemical synthesis of special polymers and polymeric composites capable supporting cell adhesion and proliferation. Both group will culture cells on their polymers, evaluate of cell-compatibility on those surfaces, and develop particular application areas on the basis of close cooperation between two groups.

4. Project Outputs

The cell adhering polymer from this joint research work will be used as cultivation supports for cell (tissue) cultures grown in laboratory or biotechnological scale and also as a component of artificial organs or biological supports which have direct contact with blood or biological systems.

5. Project Activities

In order to approach the goal of this project, both institutes, on the basis of the time schedule and allowed budget of the project, will exchange experts, work together, use facilities of counter parts, and discuss for data interpretation.

6. Project Input

UNIDO will provide US \$ 20,000 for the period March, 1990 - Feb., 1991 in convertible currency and equivalent of US \$ 20,000 in local, non-convertible currency will be provided by the countries concerned (Korea: US \$ 10,000 and Czechoslovakia: US \$ 10,000).

7. Evaluation Plan

The project will be evaluated during the implementation and upon completion by the NGOs, Business and Industrial Institutions Co-operation Section, and PDES with participants from KRICT and RIRD.

8. Envisaged Follow-up

The first phase of this three-year project will end in Feb., 1991. In the light of experiences gained during this period, a long-term follow-up project will be considered by the NGOs and Business and Industrial Institutions Co-operation Section and PDES.

PART C - CLEARANCE AND APPROVAL

Cleared by :

Date:

Date:

Approved by

Date:

Amount approved
Convertible Currency:

Source of Funds:

Other

Date PAD requested:

Annex 1

WORKING PLAN 1990 / 1991

- | <u>1. Exchange of experts</u> | <u>Duration</u> | <u>Date</u> |
|--|------------------------|--------------|
| Experts from both side will be exchanged alternately twice a year to work together, to revise the current working plan, and to discuss experimental results. | 2x14 days
(Prague) | March 1990 |
| | 2x14 dyas
(Daejeon) | October 1990 |
2. Consultants
- Consultations of experts will be held according to the needs for the solution of specific problem.
3. Exchange of information
- Periodic exchange of experimental plans, design, results, technical publications, and other informations. continuously
4. Seminar
- A seminar to evaluate the results of the first year co-operation will be held during the meeting in Daejeon October 1990

Annex 2

FINANCIAL CONTRIBUTION OF KRICT (KOREA) TO THE WORKING PLAN, 1990

<u>Expert Component</u>	<u>Duration</u>	<u>Cost</u>
Daily subsistence for 2 Czechoslovakian experts in charge on the project to visit Korea for annual meeting	2 x 14 days	\$5,600 (2x\$200/dayx14days)
<u>Communication and publication component</u>		
Allocation to cover the cost of correspondence, telex or fax for exchange of information, experimental results, papers and publications		\$3,000
Miscellaneous		\$1,400
Total		\$10,000

Annex 3

FINANCIAL CONTRIBUTION OF RIRD (CZECHOSLOVAKIA) TO THE WORKING PLAN, 1990

<u>Expert Component</u>	<u>Duration</u>	<u>Cost</u>
Daily subsistence for 2 Korean experts in charge on the project to visit Czechoslovakia for annual meeting	2 x 14 days	
Miscellaneous		
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Total		

Annex 4

FINANCIAL CONTRIBUTION OF UNIDO TO
THE WORKING PLAN 1990

<u>Expert Component</u>	<u>Expenditure</u>
Round trip tickets for 2 Korean experts to participate on the start-up meeting in Praha (Daejeon-Prague-Daejeon)	US \$ 10,000
Round trip tickets for 2 Czechoslovakia experts participating in the annual meeting in Daejeon, Korea (Prague-Daejeon-Prague)	US \$ 10,000
<u>Training Component</u>	
none	
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GRAND TOTAL	US \$ 20,000

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