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1985

THE ROLE OF THE NATIONAL RESEARCH COUNCIL OF ITALY IN GENETIC ENGINEERING AND BIOTECHNOLOGY,

15051

The National Research Council of Italy (C.N.R.) supports scientific research in a way comparable to the different Research Councils of the United Kingdom; it performs part of its efforts through its own Institutes, diffused throughout Italy and usually working in collaboration with Universities; it gives grants to different areas for research; it organizes all the "Oriented Programs" coordinating and financing the activity of research groups diffused in C.N.R. Labs,Universities, and private industries on particular areas of strategic importance from the productive point of view.

As far as genetic engineering and biotechnologies are concerned, the main C.N.R. of Italy are located in Pavia (Istituto di Genetica Biochimica ed Evoluzionistica), Rome (Istituto di Biologia Cellulare; Centro Acidi Nucleici), Naples (Istituto Internazionale di Genetica e Biofisica, Centro di Oncologia Sperimentale). Each of these institutions has a staff of 20 to 50 scientists and an approximately equal number of technicians. The areas of activity concern different aspects of genetic engineering and research. Usually recombinant DNA activity is very widespread in these.

The bulk of the activity concerns work on cloning of molecules important for the regulation of the basic biological processes, such as DNA replication, RNA synthesis, protein synthesis, cell division, etc.This concerns both microorganisms, animal and plant cells. I shall give a few examples of the sort of research programs which are actively pursued in these places:

In Pavia work is going on on the isolation and mode of action of molecules involved in DNA replication and cell proliferation in animal

cells; on the definition of the process of DNA repair in human cells; on the isolation and cloning of the genes regulating DNA replication in animal cells; for the application of genetic engineering to plant cells, and in particular to rice; for the production of human monoclonal antibodies; for the production of shuttle vectors, i.e. DNA molecules that replicate and express their genes autonomously both in bacteria cells and in animal cells; for the cloning of the genes of the Rotaviruses and Hepatitis B virus.

In Rome activity is going on on the definition of the processes for the splicing mechanisms for RNA; on the cloning of the proteins of the apparatus for protein synthesis in animals; on the study of molecular properties of the Schistosoma; on the stuay of the molecular genetics of malaria plasmodia.

In Naples, cloning of human genes is pursued in different ways, particularly those for thiroid hormones and for G6PD, an enzyme involved in the resistance to malaria.The study of inherited anemias diffused in areas with malaria is pursued both in Milan and in Cagliari. Work on nitrogen fixation and its molecular basis is pursued in Naples and Pisa.

The main Institutes of the C.N.R. and the national programs which are dealing with genetic engineering are summarized in the following tables:

MAIN CNR RESEARCH ORGANS IN THE FIELD OF GEB

PAVIA – Istituto di Genetica Biochimica ed Evoluzionistica
(Direttore Arturo Falaschi)

PISA – Istituto di Mutagenesi e Differenziamento
(Direttore Mario Terzi)

ROMA – Istituto di Biologia Cellulare
(Direttore Glauco Tocchini Valentini)

Centro di Studio per gli Acidi Nucleici
(Direttore Giorgio Tecce)

BARI – Centro di Studio sui Mitocondri e Metabolismo Energetico
(Direttore Clemente Landriscina)

NAPOLI – Istituto Internazionale di Genetica e Biofisica
(Direttore Francesco Blasi)

Centro Sperimentale per la Endocrinologia e l'Oncologia Sperimentale
(Direttore Gaetano Salvatore)

COSENZA – Istituto per lo Studio delle Malattie Ereditarie e Carenziali
(Direttore Carlo Brancati)

PALERMO – Istituto di Biologia dello Sviluppo
(Direttore Giovanni Giudice)

CAGLIARI – Istituto di Ricerche sulle Talassemie ed Anemie Mediterranee
(Direttore Antonio Cao)

PROGETTO FINALIZZATO

INGEGNERIA GENETICA E BASI MOLECOLARI DELLE MALATTIE EREDITARIE

Year	Lit.($\times 10^{-6}$)	$($\times 10^{-3}$)
1983	2921	2086
1984	3394	2424
1985	4221	3015
1986	4908	3505

PROGETTO FINALIZZATO

"INGEGNERIA GENETICA E BASI MOLECOLARI DELLE MALATTIE EREDITARIE"

Main aims:

- Industrial production of macromolecules (new or known) useful in therapy of human diseases.
- Rational and directed modification of organisms economically useful.
- Study of the molecular basis of inherited diseases aimed at their prevention, diagnosis and therapy.

Other "Progetti Finalizzati" interacting with the present project

- "Tecnologie Biomediche" (Prof. L. Donato)
  Hybridomas production for diagnosis and therapy.
- "Controllo della Crescita Tumorale" (Prof. U. Veronesi)
  Oncogenes: cloning of human genes involved in neoplastic proliferation.
- "Chimica Fine" (Prof. L. Caglioti)
  Chemical synthesis of polynucleotides; site-directed mutagenesis; bioreactors.
- "Incremento della Produzione Agricola" (Prof. E. Porceddu)
  Application of biotechnologies to plants and domestic animals.

ORGANIZATION OF THE PROGETTO FINALIZZATO

"INGEGNERIA GENETICA E BASI MOLECOLARI DELLE MALATTIE EREDITARIE"

Director: Prof. Arturo Falaschi

Subproject 1	Subproject 2	Subproject 3
Genetic Engineering	Cell Biotechnologies	Molecular basis of inherited disease
(G.Tocchini Valentini)	(F.Blasi)	(A.De Flora)
All activities utilizing in vitro manipulation of DNA aimed at modifying the genome of micro-organisms.	All activities in which genetic or cytogenetic manipulations are practiced on animal cells through fusion, microinjection or transformation.	All activities aimed at the description of the genetic and biochemical basis of inherited diseases, in view of improving the methods of diagnosis and treatment.

SUBPROJECT 1 GENETIC ENGINEERING

Line 1.1 - Gene libraries, probes and production of proteins.

Overall aims: analysis of human genome by cloning and production by microorganisms of proteins useful for therapy or industrial purposes.

Research groups 19 - Funds available: $ 500.000.

Line 1-2 - New technologies and vectors.

Setting up of gene libraries, cell lines, bacterial strands and vectors useful for production of different proteins; production of new vectors and use of bacteria other than E.coli.

Research groups 6 - Funds available: $ 190.000

SUBPROJECT 2 - CELL BIOTECHNOLOGIES

Line 2.1 - Cell transformation

Modification of animal cells by exogenous DNA and production of shuttle vectors (animal/microorganisms).

Research groups 10 - Funds available: $ 300.000.

Line 2.2 - Somatic cell hybridization and immortalization.

Research groups 2 - Funds available: $ 500.000.

SUBPROJECT 3 - MOLECULAR BASIS OF INHERITED DISEASES

Line 3.1 - Enzyme disorders.

Research groups 12 - Funds available: $ 300.000.

Line 3.2 - Plasma protein diseases.

Research groups 8 - Funds available:$ 180.000.

Line 3.3 - Immunogenetics.

Research groups 9 - Funds available: $ 270.000.

Line 3.4 - Cystic fibrosis.

Research groups 2 - Funds available: $ 65.000.

OVERALL FUNDING OF PUBLIC RESEARCH IN THE FIELD OF GEB IN 1983

(Approximate figures)

	Lit.($\times 10^{-6}$)	$ ($\times 10^{-3}$)
"Progetti Finalizzati"	4.000	3.000
CNR Research Organs	700	500
CNR Research Contracts	350	250
University Research Contracts	350	250
Research Contracts to Industries	1.000	700
TOTAL	6.400	4.700

NUMBER OF RESEARCHERS WORKING ON PUBLIC PROGRAMS IN THE FIELD OF GEB (ESTIMATE)

CNR	150
UNIVERSITY	100
OTHERS	50
TOTAL	300

Concluding remarks

In my opinion, African Countries should be particularly interested in acquiring the techniques for cloning genes useful for medicine and for agriculture. For this purpose, I think that collaborating to programs as those briefly mentioned in Pavia, Rome and Naples, would be highly advisable; in particular the acquisition of the techniques for monoclonal antibodies, the acquisition of the ability to clone any particular gene in bacteria, and the ability to intervene in plant cells can be very profitable in the future.

In this context it is worth mentioning that Italy,with the support of the C.N.R., is collaborating with India in establishing the International Center for Genetic Engineering and Biotechnology of UNIDO as a twin center in Trieste and New Delhi aimed particularly to the problems of the developing Countries.The activity in Italy should concern in particular the applications to pharmaceutical and chemical industry. The African Countries have everything to gain in the future in developing such industries, because they are quite fit to countries where biomass is easily available, because they can be very useful to improve agricultural crops and because Africa must be able to produce independently the appropriate vaccines and drugs more specific to the pathology of the continent.

Italy has developed a politics of active cooperation with the developing Countries, whereof the hosting of the UNIDO ICGEB is a prominent example. Training of African scientists and technicians in Trieste and in all the C.N.R. centers I mentioned above, is certainly welcome and I am sure will be encouraged by the Italian authorities.