

**PC-1**

**on**

**STUDIES ON THE REPAIR OF INFARCTED  
MYOCARDIUM BY REGENERATING STEM CELLS**

**CENTRE FOR APPLIED MOLECULAR BIOLOGY  
87-WEST CANAL BANK ROAD  
THOKAR NIAZ BAIG  
LAHORE**

Code Number for project

(To be filled in by  
Planning Commission)

## PART 'A' PROJECT DIGEST

1. Name of project: Studies on the repair of infarcted myocardium by regenerating stem cells.
2. Authorities responsible for:
- i) Sponsor: Ministry of Science & Technology, Government of Pakistan.
- ii) Execution: MoST Centre for Applied Molecular Biology, Government of Pakistan
- iii) Operation and maintenance: MoST Centre for Applied Molecular Biology, Canal Bank Road, Thokar Niaz Baig, Lahore.
3. Time required for completion of project: (*in months*) 48 months
4. (a) Plan provision:
- i) If the project is included in the current Five-year Plan, specify actual allocation. This project is included in the annual plan.
- ii) If not included in the current Plan, how is it now proposed to be accommodated (inter/intra-Sectoral adjustments in allocation or other resources may be indicated). N.A.
- iii) If the project is proposed to be financed out of block provision for a programme; indicate: N.A.

Total block provision	Amount already committed	Amount proposed for this project	Balance available
		N.A.	

- (b) If project is not in the Plan: what warrants its inclusion in the Plan. N.A.

5. **Relationship of the project with the objectives of the sector:**  
*Indicate the contribution of the project, quantified if possible, to the targets of the five year Plan, and the names of other projects (whether sanctioned or under preparation) which would form part of an integrated programme within the sector.*
- Under the instructions of Government of Pakistan, an integrated effort has been launched to train and produce highly qualified Ph.D's in the field of modern biotechnology and exploit the potential of newer technologies in solving specific problems of national importance. This programme will help to provide qualified researchers in the sectors of education, S&T, and industry.
6. **Capital cost of project:**
- |                         |                   |
|-------------------------|-------------------|
| Local costs:            | Rs. 38.18 million |
| Foreign exchange costs: | NIL               |
| Total                   | Rs. 38.18 million |
7. **Annual recurring expenditure after completion:**
- |        |                  |
|--------|------------------|
| Local: | Rs.5.50 million  |
| F.E.C. | NIL              |
| Total: | Rs. 5.50 million |
8. **Objectives of the project preferably in quantitative terms:**
1. Study the effect of cellular stress and other factors that influence the proliferation of stem cells.
  2. Study the temporal acquisition of structural cardiac phenotype and ultimate differentiation of engrafted stem cells in infarcted myocardial microenvironments and whether it leads to repair and improved cardiac function.
  3. Study if regeneration of stem cells can initiate repair of infarcted areas in the heart, thus restoring normal heart function.
- Specific Aims:**
- 1: To determine whether stem cells can form functional cardiac muscle and endothelial cells
  - 2: To determine whether transplanted stem cells align with the host myocytes forming intercellular connections.

3: To determine whether transplantation of adult derived stem cells in the host myocardium lead to improved cardiac function.

4: To determine whether stem cell accelerates myocardial repair after infarction.


5: To determine whether stem cells induce angiogenesis in the ischaemic area.

PREPARED BY:

  
(DR. SYED SARFRAZ HUSSAIN)

  
(DR. S. RIAZUDDIN)

CHECKED BY:

  
(DR. ZAHOOR AHMAD)

APPROVED BY

  
(DR. S. RIAZUDDIN)  
Director CAMB

## PART 'B'

### PROJECT DESCRIPTION AND FINANCING

9. **Location of project:** *(Attach map) give name of place and administrative districts in which the Research institute/Center will be selected.*

MoST Centre for Applied Molecular Biology, 87-West Canal Bank Road, Thokar Niaz Baig, Lahore-53700, Pakistan.

10. **Existing facilities:** *Give information about the organization doing similar research work at present. indicate their staff, budget for the last five years and their output in terms of number of studies etc. Mention if there is any organization to ensure coordination of work done by different research institutes.*

No active research on regeneration of stem cell and its potential in the repair of infarcted myocardium is being carried out anywhere in Pakistan. Recently, however, a project on repair of damaged cochlear functions by cell therapy has been initiated by the National Centre of Excellence in Molecular Biology (NCEMB) and the School of Biological Sciences (SOBS). However, the focus of this project is on regeneration into neuronal cells.

11. **Description of project:**

- (a) *Give brief history, proposed facilities and justification of project. Indicate the basis for selecting the area of research and justify the priority that should be given to the area. Indicate the benefit of research to the sector and the economy.*

The ability of stem cells to differentiate into tissue specific cells and thus repair various organs damaged by different diseases has opened new avenues in the therapy of infarcted heart, kidney malfunctioning and liver cirrhosis. There are potential differences in the differentiation of different stem cells such as embryonic stem (ES) cells, adult-derived stem cells and germ-derived stem cells. Furthermore, the microenvironment in different tissues has profound influence on the qualitative and quantitative levels of tissue specific regeneration. The cardiac microenvironment made up of the extra cellular matrix, paracrine humoral agents, and the functioning parenchyma, may differ in healthy, aged and infarcted heart tissues. A stem cell modulates different behaviour under the influence of different environment and thus exhibit different phenotypic expressions. Thus the study of stem cell organogenesis in different microenvironment, has become an important research endeavour. Stem cells may hold the potential to form needed cell type in cases where disease or injury has destroyed the original cell. The results of such a study will eventually lead to practical uses of stem cells in the therapy of some of the most fatal diseases.

- (b) *Indicate relationship with other programmes in the same sector and in other sectors.*

Project is of high quality basic research which will eventually have applications in health and medicine.

Execution of the project will create facilities for continued and sustained production of specific types of adult derived stem cells as well as create a nucleus of specifically trained manpower.

- (c) *Mention the intermediate outputs in the form of number of study papers to be produced within the next five years. Indicate whether these studies would result in commercial application or commercial leasing out of the process developed. If so, indicate expected income.*

The whole of the country will be served.

- (d) *Administrative arrangements for conducting research. Give availability of manpower in the specialized field. Indicate methods of dissemination of research findings.*

The project will be carried out in the laboratories of the Centre for Applied Molecular Biology, 87-West Canal Bank Road, Thokar Niaz Baig, Lahore, under the administrative authority of the Director, Dr. S. Riazuddin. Four Ph.D. research students, and two Post-doctoral Fellows will be inducted into this programme. Prof. Anversa, from New York Medical College, USA and Prof. M. Ashraf, from University of Cincinnati, USA will help to train Ph.D. students in USA. Those Ph.D. students trained as part of these studies will provide a core of specifically trained manpower for employment in any of the major universities and thus contribute to improved teaching as well as high quality research in the country. Four young researchers will spend 12-18 months each in USA to undertake the proposed studies. Provision is made in the budget for the proposed training.

**12. Arrangements for monitoring and evaluation of the project during implementation.**

The Ministry of Science & Technology (ST&R Division), Planning Division as well as foreign peer review committee of the Centre for Applied Molecular Biology will be responsible for the monitoring and evaluation of the project.

**13. Give date when capital expenditure estimates were prepared: If prepared more than one year ago, confirm if they are still valid.**

May, 2002

14. **Give summary of capital cost, covering the whole of the investment period as indicated below:**

(In Million Rupees)

ITEMS	Year 1	Year 2	Year 3	Year 4	TOTAL
1. Salaries	0.60	0.60	0.60	0.60	2.40
2. Training	1.30	1.80	1.80	1.30	6.20
3. Equipment	5.50	4.68	0.00	0.00	10.18
4. Research Materials	2.30	2.30	2.50	2.60	9.70
5. Fabrication of Clean Room Facility	5.00	1.50	0.50	0.50	7.50
6. Miscellaneous	0.50	0.70	0.50	0.50	2.20
<b>TOTAL</b>	<b>15.20</b>	<b>11.58</b>	<b>5.90</b>	<b>5.50</b>	<b>38.18</b>

15. **Basis of cost estimates:** *(give full details)*

The costs are estimated on actual at the existing scale of stipend for Ph.D. research fellows at Rs.5000/month and post-doctoral fellows at Rs.15000/month. The cost of research materials and equipment is estimated at the prevailing market prices.

16. **Financial plan:**

- (i) *Give complete sources of financing of the project. Clarify sources of financing such as federal/provincial, foreign/local grant/loan etc.*

Government of Pakistan

- (ii) *Provide details of recurrent expenditure on the basis of fixed and variable costs. Also specify the items such as establishment charges, interest payments, depreciation and non salary items, maintenance charges, etc. Indicate the operational arrangements of implementation and the agency responsible for meeting the recurrent cost.*

N.A.

17. **Beneficiary participation:**

*Executing agencies to confirm whether prospects for beneficiary participation have been considered and if so, provide a detailed mechanism for involving beneficiary.*

The project is of high quality basic research which will eventually have applications in health & medicine. As such, beneficiary participation has not been considered at this stage.

18. **Risk analysis:**

*Give a detailed list of assumptions and the basis of changes therein. Also Indicate likely events which may delay the projects and means of addressing these delays.*

Untimely of funds may cause delays in the execution of project.

19. **Estimates of annual recurring expenditure after completion of each phase of project:** *(Also indicate the source of financing recurring expenditure).*

*(in million rupee)*

	Local	F.E.C.	Total
(a) Establishment	2.00	—	2.00
(b) Research Consumables	2.50	—	2.50
(c) Library & computer	0.50	—	0.50
(d) Other costs	0.50	—	0.50
<b>TOTAL:</b>	<b>5.50</b>	<b>—</b>	<b>5.50</b>

20. **Authority responsible to meet the recurring expenditure after completion of the project.**

ST&R Division of the Ministry of Science & Technology, Government of Pakistan.

21. **Unit cost for each category of service or output:** *Indicate number of technical personnel and man years, number of studies, cost per study cost per man year.*

This is a project of research therefore unit cost cannot be calculated.

22. **Comparative unit cost of similar projects under implementation and completed.**

No other organization is engaged in the kind of research, therefore, comparative unit cost cannot be calculates.

23. **Give statement showing phasing of repayment of loans: indicate debt-servicing capacity (i) of project, (ii) of loan receiving organization:**

N.A.

24. **In case of industrial research, if the processes developed are to be leased to commercial firms, give cash flow statement (inflow and outflow) for the next five years.**

N.A.

25. **Annual phasing of physical work and financial requirements for the project:**  
(Attach bar Diagrams)

(in million rupees)

	Percentage of physical work	Local	Financial requirements	
			F.E.C.	Total
Ist year	40%		—	15.20
2nd year	30%		—	11.58
3rd year	15%		—	5.90
4th year	15%		—	5.50
<b>Total:</b>	<b>100%</b>		—	<b>38.18</b>

## PART 'C'

### PROJECT REQUIREMENTS

26. (a) **Manpower:**

I. <u>Regular Project Staff</u>	<b><u>FOR EXECUTION Man Months</u></b>	<b><u>FOR OPERATION Number</u></b>
Professional and technical Scientific Posts	240	5
II. <u>Consultants</u>		
1. Local	N.A.	N.A.
2. Foreign	-	-

(b) *Give list of employment to be generated by gender.*

Male	3	Female	2
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(c) *Give manpower required during the first year of the implementation of project. Give details of specific skills required (scientists, lab/field workers, technician etc.) separately for male and female and their grades.*

(d) *Likely shortage of manpower by occupation.*

N.A.

(e) *Steps to be taken to assure availability of manpower.*

N.A.

(f) *Approximate number of persons required to be trained per year (locally and abroad) and the kind of skills to be learnt.*

N.A.

27. **Civil works:**

- (a) *Total covered area of the building (basic for determining the space requirement) alongwith Line-plans, number of stories, etc.*

Yes (4000 sq.ft)

- (b) *If houses, provide their number and categories alongwith covered area and Line-plans.*

N.A.

- (c) *Size of the plot on which building/houses are to be constructed viz the percentage of open and constructed area.*

N.A.

- (d) *Give description of already completed or under construction building/houses viz. the new proposed construction.*

N.A.

- (e) *Existing water-supply and sewerage arrangement in the area as well as for the present project.*

Water-supply and sewerage to the Centre for Applied Molecular Biology will be used.

- (f) *Unit-cost supported by item-wise detailed estimates of the building/houses separately for civil-works, water supply, sewerage other utilities including HVAC (if present), external development etc.*

N.A.

- (g) *Percentage of contingencies, departmental charges and escalation based on base-cost.*

N.A.

28. **Physical and other facilities required for project:**

Item	To be provided from Project itself	To be provided from Public Utility
(a) Power supply		
(b) Water		
(c) Other utilities	These facilities already exists at CAMB	
(d) Education facility		
(e) Others		

29. **Materials, supplies and equipment requirement:**

**A-I** Minimum total requirements for execution:  
To be completed only for major items costing more than 10% of the total cost.

Item	Unit	Quan- tity	<u>Local</u> unit rate	Cost	Quan- tity	<u>Foreign</u> Unit rate	Cost	Already available with the Agency
1. Materials								
(a)	N.A.							
(b)								
(c)								
2. Spares and supplies								
(a)	NIL							
(b)								
(c)								
3. Equipment and machinery								
(a)	NIL							
(b)								
(c)								

**A-II** Materials, spares and supplies and equipment for operation of project:

	Unit	Quan- tity	<u>Local</u> unit rate	Cost	Quan- tity	<u>Foreign</u> unit rate	Cost
1. Materials							
(a)			N.A.				
(b)							
(c)							
2. Supplies and spares							
(a)			N.A.				
(b)							

30. **In the case of imported material and equipment for execution, indicate:**

(a) Justification for Imports

The equipment and research consumables are not manufactured locally and are only available from manufacturers in the developed world.

(b) *Proposed source of supply:*

N. A.

## PART 'D'

### ENVIRONMENTAL IMPACT ASSESSMENT

31. **Indicate environmental impact likely to be generated as a result of implementation of the project. Detailed quantification and analysis of the likely impacts separately on human life, animal life, forests and vegetation etc. should be provided. The quantification of impacts should include the following:**
- |       |                                                                                                                                                                                                    |      |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| i)    | Traffic noise.                                                                                                                                                                                     | NIL  |
| ii)   | Air pollution.                                                                                                                                                                                     | NIL  |
| iii)  | Water pollution.                                                                                                                                                                                   | NIL  |
| iv)   | Drainage/Run off.                                                                                                                                                                                  | NIL  |
| v)    | Community Severance.                                                                                                                                                                               | NIL  |
| vi)   | Crop yield.                                                                                                                                                                                        | NIL  |
| vii)  | Ground water contamination.                                                                                                                                                                        | NIL  |
| viii) | People's health.                                                                                                                                                                                   | NIL  |
| ix)   | Wild Life.                                                                                                                                                                                         | NIL  |
| x)    | Ecology.                                                                                                                                                                                           | NIL. |
| xi)   | Bio-physical characteristics of the project site including water, geology and soils, ecological (aquatic & terrestrial) natural resources (mineral/ forestry/agriculture), and visual quality etc. | NIL  |
| xii)  | Restoration/ preservation and re-use of disturbed areas, through embankments etc.                                                                                                                  | N.A. |
| xiii) | Protection of habitats along - communication routes i.e. roadways, rail track and around an airport etc.                                                                                           | N.A. |

