

## ***SAMPLE***

### **Research Project Research Roadmap™/Associated Budget**

**TITLE: Development of a Bio-mimetic Drug Delivery System**

**FUNDING AGENCIES:** Goldman Philanthropic Partnerships, Rockefeller Brothers Fund

**GPP PROJECT CODE #:** 03-0331IK

**FUNDING PERIOD:** April 1, 2003-March 31-2004

**TOTAL OPERATING BUDGET:** \$25,000

#### **SPECIFIC AIMS AND OBJECTIVES OF RESEARCH PLAN**

First Quarter: April 1, 2003-June 30, 2003

Research Objective 1: Expression/Purification of proteins P1, P2

Research Objective 2: Synthesis of lipid analogs to P1, P2

Second Quarter: July 1, 2003-Sept. 30, 2003

Research Objective 3: Preparation and characterization of liposomes

Research Objective 4: Incorporation of molecules into liposomes

Third Quarter: October 1, 2003-December 31, 2003

Research Objective 5: Release studies of model components using fluorescent-labeled tracers

Research Objective 6: Binding studies on fixed cells

Fourth Quarter: January 1, 2004-March 31, 2004

Research Objective 7: In vitro cell culture binding studies

Research Objective 8: Uptake and endosomal drug release evaluation

## **SAMPLE**

**TITLE:**

**FUNDING AGENCIES:** Goldman Philanthropic Partnerships, Rockefeller Brothers Fund

**FUNDING PERIOD:** April 1, 2003-June 30, 2003

RESEARCH PLAN BUDGET

A. Budget for Research Plan, 1st quarter:

1.	<i>Salary and Fringe Benefits</i>	
	Principal Investigator: Ilya Koltover, PhD .....	\$0.00
	Project Investigator: Jianqin Liu, PhD (Time – 25%) .....	\$2473.00
2.	<i>Materials, Reagents and Supplies</i> .....	\$3000.00
3.	<i>Analytical Service</i> .....	\$314.00
4.	<i>Indirect Expenses</i> .....	\$463.00
	<i>Total First Quarter Research Budget</i> .....	\$6250.00

**TITLE:**

**FUNDING AGENCIES:** Goldman Philanthropic Partnerships

**FUNDING PERIOD:** July 1, 2003-Sept. 30, 2003

RESEARCH PLAN BUDGET

A. Budget for Research Plan, 2nd quarter:

1.	<i>Salary and Fringe Benefits</i>	
	Principal Investigators: Ilya Koltover, PhD.....	\$0.00
	Project Investigator: Jianqin Liu, PhD (Time – 25%) .....	\$2473.00
2.	<i>Materials, Reagents and Supplies</i> .....	\$3000.00
3.	<i>Analytical Service</i> .....	\$314.00
4.	<i>Indirect Expenses</i> .....	\$463.00

*Total Second Quarter Research Budget* ..... \$6250.00

## **SAMPLE**

**TITLE:**

**FUNDING AGENCIES:** Goldman Philanthropic Partnerships

**FUNDING PERIOD:**

RESEARCH PLAN BUDGET

A. Budget for Research Plan, 3rd quarter: October 1, 2003-December 31, 2003

1.	<i>Salary and Fringe Benefits</i>	
	Principal Investigators: Ilya Koltover, PhD.....	\$0.00
	Project Investigator: Jianqin Liu, PhD (Time – 25%) .....	\$2473.00
2.	<i>Materials, Reagents and Supplies</i> .....	\$3000.00
3.	<i>Analytical Service</i> .....	\$314.00
4.	<i>Indirect Expenses</i> .....	\$463.00
	<i>Total Third Quarter Research Budget</i> .....	\$6250.00

**TITLE:**

**FUNDING AGENCIES:** Goldman Philanthropic Partnerships

**FUNDING PERIOD:**

RESEARCH PLAN BUDGET

A. Budget for Research Plan, 4th quarter: January 1, 2004-March 31, 2004

1.	<i>Salary and Fringe Benefits</i>	
	Principal Investigators: Ilya Koltover, PhD.....	\$0.00
	Project Investigator: Jianqin Liu, PhD (Time – 25%) .....	\$2473.00
2.	<i>Materials, Reagents and Supplies</i> .....	\$3000.00
3.	<i>Analytical Service</i> .....	\$314.00
4.	<i>Indirect Expenses</i> .....	\$463.00
	<i>Total Fourth Quarter Research Budget</i> .....	\$6250.00

## **SAMPLE**

**TITLE:**

**FUNDING AGENCIES:** Goldman Philanthropic Partnerships

**FUNDING PERIOD:**

### RESEARCH PLAN BUDGET

A. Budget for Research Plan, Overall year 1: April 1, 2003-March 31, 2004

1.	<i>Salary and Fringe Benefits</i>	
	Principal Investigators: Ilya Koltover, PhD.....	\$0.00
	Project Investigator: Jianqin Liu, PhD (Time – 25%) .....	\$9892.00
2.	<i>Materials, Reagents and Supplies</i> .....	\$12000.00
3.	<i>Analytical Service</i> .....	\$1256.00
4.	<i>Indirect Expenses</i> .....	\$1852.00
	<i>Total Research Budget</i> .....	\$25000.00

## **SAMPLE**

### **Research Project Reporting Template**

**TITLE:** Development of a Bio-mimetic Drug Delivery System

**FUNDING AGENCIES:** Goldman Philanthropic Partnerships, Rockefeller Brothers Fund

**GPP PROJECT CODE #:** 03-0331IK

**FUNDING PERIOD:** July 1, 2003-September 30-2003

**PRINCIPAL INVESTIGATOR:** Dr. Ilya Koltover

### **SECOND QUARTER AIMS AND OBJECTIVES OF RESEARCH PLAN**

#### **A. Research Objective 3: Preparation and characterization of liposomes**

##### 1. Description of research work completed:

After completion of the first quarter research, we have had a few remaining problems with lipid/peptide synthesis and purification. In particular, purification of the proposed fully biosynthetic functional molecules P1 and P2 has proven to be difficult, while semi-synthetic approach, coupling terminal peptides to novel PEG-derivatised lipid anchor molecules appeared to be promising. Over the last two months, our research has lead to the following conclusions, that mainly finalize the decisions on the synthetic strategy:

I. Fully biosynthetic approach is feasible (by incorporating the P1 and P2 into fusion proteins and facilitating purification), but vary time consuming. The full P1 and P2 consisting of three polypeptide segments (hydrophobic anchor, flexible linker and targeting/pH trigger domain), are difficult to characterize (e.g. by MS or NMR) and hard to handle (solubility). Given the limited man-power and budget of the project, we will abandon (for the time being) this approach for the semi-synthetic strategy.

II. Three semi-synthetic lipids has been made, incorporating pH sensitive peptide prepared by SPPS technique. The three molecules have three different length of linker between hydrophobic (hydrocarbon) portion of the lipid and the functional peptide: no linker, short (MW 600) linker, and long (MW 3,000) linker. Study of the relation between linker length and lipid functionality was one of the central goals of the proposed research, and this synthetic accomplishment is an important milestone in the project. The synthesis is novel and publishable.

The synthetic lipid/pH peptide molecules were incorporated into liposomes (DOPC lipid as the main component) at 0.1, 0.5, and 1 mol% concentrations. This was accomplished from dry preparations of the lipid mixtures by hydration and extrusion. An ethanol injections procedure was also adopted for the preparation of somewhat larger (10 $\mu$ m vs 0.2 $\mu$ m) size liposomes that will be useful for drug release tests.

The liposomes are characterized by light scattering and negative staining TEM. So far, it appears that incorporation of the functional lipids into liposomes does not destabilize

them at neutral pH.

2. What problems were encountered?

See above.

3. What discoveries were made?

See above

4. How did results of work on this objective create any need to alter the plan going forward?

See above. The project is focusing now on semi-synthetic lipids. This is a natural convergence based on research progress to date.

#### **B. Research Objective 4: Incorporation of molecules into liposomes**

1. Description of research work completed:

Model compounds calceine and fluorescent dextran (MW6,000) were encapsulated inside liposomes with pH-sensitive lipid membranes both during extrusion and ethanol injection. Un-encapsulated material was separated either by centrifugation or gel filtration. Both procedures appear to be successful. Efficiency of encapsulation (e.g. loading ratios) are being evaluated, and we should be able to focus on a single procedure in the next couple of weeks.

2. What problems were encountered?

This stage of the project appears to be less problematic, compare with the synthesis of lipids. pH-triggered release studies will be started as soon as this report is approved.

3. What discoveries were made?

4. How did results of work on this objective create any need to alter the plan going forward?

#### **C. What new hiring or equipment purchases were made during this period?**

Dr. Michael Zhuravel (postdoc) has taken over the project (from the departed Jianqin Liu). His salary was not, thus far, charged to the grant, but will be in the next three months.

**D. What results were published through what vehicles, internal and external? What other publications did the researchers publish that would be of interest to those supporting your research, or what other information was published that might be relevant to this research? (please include citations only)**

**E. Is there anything additional you would like to share with those supporting your research?**