MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING IS DATED ...03... MONTH ...14th... DAY

OF 2019 AND MADE BETWEEN:

1.The **CSIR-Indian Institute of Chemical Technology (IICT),** Uppal Road, Tarnaka, Hyderabad-500 007, India, a constituent unit of the Council of Scientific and Industrial Research (CSIR), a Society registered under Societies Registration Act (XXI of 1860), having its registered Office at Anusandhan Bhavan, Rafi Marg, New Delhi – 110 001.

(hereinafter referred to as **CSIR-IICT**, which expression shall where the context so admits include its successors and permitted assignees)

And

2. Yenepoya (Deemed to be University), Mangalore, Karnataka, India (hereinafter referred to as **YU,** which expression shall where the context so admits include its successors and permitted assignees) of the other part.

1.0 Introduction:

1.1 CSIR- IICT & YU agree to enter into a joint collaboration for biological research on cancer especially for developing and optimizing therapeutics against cancer stem cells which epitomize the highly drug-resistant phenotypes in cancer.

1.2 This Memorandum of Understanding ("MOU") sets out below the principles followed by the CSIR- IICT & YU that can establish a formal agreement regarding such activity.

2.0 Fields of Competence (CSIR- IICT):

The Indian Institute of Chemical Technology (CSIR-IICT) is a leading Institute in India with expertise in several branches of chemistry especially in Organic Synthesis including Agrochemicals, natural products, medicinal chemistry, physical photochemistry backed up by world class analytical services and equipment for automated chemistry.

Terminal diseases, like cancer is given special attention and several programs are underway for development of new chemical entities as anti cancer therapeutics.

ATTESTED

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Registrar
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Mangalore- 575 018, Karnataka

IICT has also taken a lead in the development of drug delivery systems, especially for anticancer drugs. The integrin receptor specific liposomal delivery systems were found to be highly efficient for targeting anti-cancer drugs/genes selectively to tumor vasculatures in anti-angiogenic cancer therapy. IICT has also developed Sigma Receptor, Estrogen Receptor, Folate Receptor, Glucocorticoid Receptor-Specific liposomal delivery systems for use in Targeted Cancer Therapy. To screen and for preclinical evaluation of new delivery systems and therapeutics, target-based biochemical screens and cell-based screens for biological activity against diseases, a dedicated chemical biology facility is also arranged as part of research.

Fields of Competence (YU):

The Yenepoya (Deemed to be University) is one of the premier private Universities in southern India with expertise in several branches of medical fields. The major strength of this University is its existence primarily as a Medical University, thereby enabling the accessibility of patient samples. Yenepoya Research Centre (YRC) of YU is an upcoming research centre that was established in 2008. YRC was initially established to serve as a central research support system for the constituent colleges (Medical, Dental, Pharmacy, Nursing and Physiotherapy) of Yenepoya (Deemed to be University). YRC has state-of the art facilities to support high quality research in interdisciplinary/ multidisciplinary areas to meet the contemporary challenges. Currently, part from being a central research facility, various research groups/divisions are operational in YRC undertaking independent basic/applied research work. All of these research groups/divisions in YRC have internationally trained faculties with highest credentials. The research work in YRC is primarily funded with extramurally received funds from various agencies of the Government of India, as well as, YU's intramural funding.

Stem cell and regenerative medicine centre (SCRMC) is a division under YRC having that undertakes specialized research work in the area of regenerative and cancer stem cell biology. This group/division has established the basic biology of breast and colon cancer stem cells and its targeting using water soluble vitamins.

3.0 Principles

3.1 The activities covered by this MOU will centre on the following:

i. To develop newer, targeted delivery systems and cancer stem cell (CSC)-targeting molecules by CSIR-IICT.

ii. Isolation, maintenance, propagation of cancer stem cells.

iii. Exchange of materials and cell lines between the CSIR-IICT and YU

iv. To conduct biological testing of the new chemical entities and delivery systems synthesized or developed by CSIR-IICT on the CSCs isolated in YU in both the Institutes, CSIR-IICT and YU.

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v. To conduct tests or experiments with CSIR-IICT materials on patient derived primary cells and on patient derived samples' humanized animal models in YU in accordance with proper human ethical clearance.

vi. For the flow of research there shall be exchange of students between CSIR-IICT and YU.

vii. Output of the results will be shared in the form of joint-co-authored research publications. The exchange of publications and other materials (related to publications and reports) is of common interest.

viii. All reports to be sent for publication arising out of the joint research will bear names of investigators from both the institutions.

3.2 Any activity carried out within the broad framework of this MOU shall be the subject to the mutual consent of parties, taking into account any constraints of time, funding and other relevant resources.

3.3 It is recognized that the work carried out jointly through the collaboration will require special intellectual property protection. Legal agreements defining joint technology development will need to be implemented and will need to recognize the nature of the collaboration.

3.4 For the entire duration of the '**Joint Collaboration**' the partners undertake to seek each other's consent for the publication of any results arising from the research carried out by the Parties. This consent may only be withheld where justified.

3.5 In case of IP generated out of the outcome of the joint research, it must be first patented by either of the parties before they go into its publication.

3.6 If the outcome of the collaboration studies yields encouraging results useful to society or industry then, it can be pursued for attracting external funding from Govt. /Pvt. Agencies for advancement of the developed technology/process and for such purpose a joint research proposal can be submitted.

3.7 The intellectual property rights arising out of the programme shall be the common property between the two organizations. CSIR-IICT shall file the joint patent application and all the necessary support like the persons who have directly contributed to the intellectual property generation shall be mentioned as inventors by CSIR-IICT and YU.

3.8 The sharing of intellectual property among the two organizations shall be in the ratio of 50:50 (CSIR-IICT and YU).

3.9 The expenditure connected with securing and maintaining the Intellectual Property Rights shall be shared equally in the above said ratio by CSIR-IICT and YU.

4.0 The sharing of revenues, in case if it is licensed / commercialized shall be shared in the above said ratio between the two Institutes, namely 50:50 (CSIR-IICT and YU).

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4.1 The molecules and delivery systems provided by CSIR-IICT if found active in biological testing in CSCs, will also be tested in advanced animal models developed in both CSIR-IICT and YU after obtaining appropriate clearances from the Animal Ethics Committee.

5.0 Separate Agreements: In addition, it is envisaged that each activity, that the parties wish to pursue in accordance with the purpose of this MOU will be governed by terms and conditions to be separately negotiated and mutually agreed upon by the parties through the signing of one or more subsidiary agreements.

6.0 Renewal Amendment and Termination:

6.1 This MOU shall be effective for an initial period of **5 years** from this date. Thereafter, this MOU may be extended for further periods of 5 years or for any other period of time as deemed appropriate by both parties, subject to their mutual consent any such extension to be made in writing.

6.2. Either party may amend or vary this MOU at any time provided it is with the prior written consent of both parties.

6.3. Either party may terminate this MOU at any time by giving six month's notice to the other party in writing.

7.0 General

7.1 The parties to this MOU shall not be deemed to be in breach of this understanding or otherwise liable to any other party in any manner whatsoever for any failure or delay in performing or initiating the activities proposed in this MOU.

7.2 This MOU records the understanding between the parties and is not intended to be a legally binding document and shall not be enforceable in any court of law.

ATTESTED
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Registrar
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University Road, Deralakatte
Mangalore- 575 018, Karnataka

Registrar
For/on behalf of

CSIR-IICT
[For/on behalf of]

Yenepoya University	Director, CSIR-IICT
Signed _____	Signed _____ 14/3/2019
Name: Dr K.S. GANGADHARA SOMAYAJI	**Name:**
Designation: Registrar	**Designation:**
Date: 20/03/2019	**Date:**
Seal:	**Seal:**

Registrar
Yenepoya (Deemed to be University)
University Road, Deralakatte
Mangalore 575 018

डॉ. पि. राधा कृष्णा
Dr. P. Radha Krishna
मुख्य वैज्ञानिक एवं अध्यक्ष / Chief Scientist & Head
ज्ञान एवं सूचना प्रबंधन प्रभाग
Knowledge & Information Management Division
सीएसआईआर-भारतीय रासायनिक प्रौद्योगिकी संस्थान
CSIR-Indian Institute of Chemical Technology
Tarnaka, Hyderabad - 500 007.Telangana, India.

Witnesses

1)	2)
Name:	Name:
Designation:	Designation:
Affiliation:	Affiliation:

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सीएसआईआर -भारतीय रासायनिक प्रौद्योगिकी संस्थान
CSIR - Indian Institute of Chemical Technology
(Council of Scientific and Industrial Research)
विज्ञान एवं प्रौद्योगिकी मंत्रालय, भारत सरकार / Ministry of Science & Technology, Govt. of India.
तारनाका, हैदराबाद, तेलंगाना / Tarnaka, Hyderabad, Telangana - 500 007

To Whom It May Concern:

This is to inform you that Mr. Utsav Sen, ICMR SRF/Ph.D. scholar at Stem Cell and Regenerative Medicine Centre, Yenepoya Research Centre, Yenepoya (Deemed to be University), Mangalore visited my laboratory in CSIR-Indian Institute of Chemical Technology, Hyderabad to perform collaborative research, which is a part of his ongoing doctoral research in Yenepoya. He worked in my lab beginning Feb 10, 2020 and until March 6, 2020. He basically performed optimization studies related to nucleic acid transfection in breast cancer stem cells (BCSC), isolated in Yenepoya (SCRMC-YRC facility). He also performed drug-sensitization studies in drug-resistive BCSCs. Besides this, he learned the technicalities of confocal microscopy related to co-localization studies in BCSCs. He also learnt preparation of orthtopic colon cancer through live animal observation and also performing live animal imaging.

Kindly contact me back if you have any further query.

Thanking you,

Sincerely,

6/03/2020

Rajkumar Banerjee
राजकुमार बैनर्जी, पी एच डी
Rajkumar Banerjee, Ph.D.
वरिष्ठ प्रमुख वैज्ञानिक/Senior Principal Scientis
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Self Attested
9/3/2020

Gmail

Utsav Sen <utsavsen.bio@gmail.com>

ltsav_work plan for transfection experiments_bCSCs

messages

tsav Sen <utsavsen.bio@gmail.com> Sat, Jan 11, 2020 at 4:28 PM
o: Rajkumar Banerjee <banerjee@iict.res.in>, Bipasha Bose <bipasha.bose@gmail.com>, sudhir shenoy shenoy2000@yahoo.com>

Dear Sir,

Good evening!!

Concerning our telephonic conversation, I am sending you the study plan that we want to perform in your laboratory. Initially, I would like to get trained in the transfection experiments involving siRNA in your lab and its delivery system, and then with your advice, I will go ahead with the planned experiments. So I would request you to please go through the experimental plan as attached and give your valuable suggestions.

I want to co-ordinate with your student for my stay and the other administrative work. Further, I would like to know what are the chemicals and other consumables I have to bring along with me (apart from the cells).

I am planning to come to your lab on January 31, 2020, so that I can start my work from February 1st, 2020. I want to stay until the work ends.

I am looking forward to your response.

Sincerely,

Thanks and regards,

Utsav

Mr Utsav Sen
ICMR-Senior Research Fellow/PhD Scholar
Stem Cells and Regenerative Medicine Centre
Yenepoya Research Center
Yenepoya University
Mangalore-575018
India.

IICT_WORKPLAN.pptx
54K

ajkumar Banerjee <banerjee@iict.res.in> Mon, Jan 13, 2020 at 11:05 AM
o: utsavsen bio <utsavsen.bio@gmail.com>
c: bipasha bose <bipasha.bose@gmail.com>, shenoy2000@yahoo.com

Thank you Utsav for your mail and willingness to learn siRNA transfection in our lab.
Although it is routine and easy, it is better to have hand on experience with our transfecting agent in the optimised condition in our lab.
So, from your ppt one thing is not clear to me about if you will also do the experiment(s) related to Oct4 siRNA transfection (for Oct4 knockdown in bCSCs) along with control siRNA (scrambled one) transfection. The Oct4 overexpression experiments can be done at your end.
But remember, as going by your experimental plan, if you want to make a reliable and authentic comparison between different treatment groups as correctly delineated in the ppt, all the experiments should be done with the same isolated batch of bCSCs, if possible.
If this is so, in our lab you can learn how to do the siRNA transfection, see the delivery efficiency using a fluorescently labeled scramble siRNA. I will check if it is available in sufficient quantities in our lab for you to learn. If not, I will immediately order it. Then we will give you ample amount of transfecting agent for you to perform experiments in Yenepoya. The transfection agent can do two things:
a) deliver siRNA for knockdown purposes.
b) also, if not established by any other means, deliver Oct4 plasmid for over-expression purposes. But this one is not mandatory though.

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Tell me your thoughts,

rajkumar

p.s. My current students just now informed that as their seniors mostly used the available last batches, we have shortage of fluorescently labelled Sc-siRNA, which are kept as contingency for the seniors whose papers are in review. Now, I plan to order it and other therapeutic siRNAs today through our known vendors. Hope to receive these soon or by Feb 1st week. In that case I suggest you to either plan your visit as soon as I receive the siRNA or you can still visit to learn general transfection using our transfection reagents without delay.

Rajkumar Banerjee, Ph.D.
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From: "utsavsen bio" <utsavsen.bio@gmail.com>
To: "Rajkumar Banerjee" <banerjee@iict.res.in>, "bipasha bose" <bipasha.bose@gmail.com>, shenoy2000@yahoo.com
Sent: Saturday, January 11, 2020 4:28:58 PM
Subject: Utsav_work plan for transfection experiments_bCSCs
[Quoted text hidden]

Utsav Sen <utsavsen.bio@gmail.com> Wed, Jan 15, 2020 at 9:42 AM
To: Rajkumar Banerjee <banerjee@iict.res.in>
Cc: bipasha bose <bipasha.bose@gmail.com>, sudhir shenoy <shenoy2000@yahoo.com>
Bcc: Saketh Kapoor <sakethk@yenepoya.edu.in>

Dear Sir,

Thank you so much for your mail and giving this opportunity to learn siRNA based transfection in your laboratory.

I will share some of my thoughts. Before that, I would like to clear some of the questions that you have asked me.

1. **The Oct-4 overexpression experiments can be done later in our lab:** Indeed it can be done in our laboratory, once I will get trained with the transfection technique, then I can perform the same experiments in our Lab, because later for validation purpose, we have to do qRT-PCR and western blot experiments to show the overexpression.

I would also like to include, why this overexpression is very important for this study:

In our study we observed that, upon treatment with Vitamin C (10mM and 20mM), there was a significant decrease in Oct-4 expression with concomitant apoptosis in bCSC. To prove this hypothesis it is very important to show that the cells are not undergoing apoptosis in Oct-4 overexpressed bCSCs after vitamin c treatment.

Most importantly, I will perform all the experiments in the same batch of the bCSCs as mentioned by you.

I would like to come in the 1st week of February and I hope by that time si-RNA will be available to do the transfection experiments. If not, I will learn the transfection technique and how to determine transfection efficiency.