

MEMORANDUM OF UNDERSTANDING
BETWEEN
AMITY UNIVERSITY, MAHARASHTRA, INDIA
AND

ARIZONA BOARD OF REGENTS ON BEHALF OF THE UNIVERSITY OF ARIZONA, USA

This MEMORANDUM OF UNDERSTANDING ("MOU") is made and entered into force on the date of the last authorized signature below (the "Effective Date") between **AMITY UNIVERSITY MAHARASHTRA ("AUM")** situated at Mumbai-Pune Expressway, Panvel, Mumbai, 410206, India, represented by the Vice Chancellor; AND **ARIZONA BOARD OF REGENTS ON BEHALF OF THE UNIVERSITY OF ARIZONA ("UNIVERSITY")**, situated at 888 N. Euclid Ave., Rm 515, Tucson, Arizona 85719-4824, USA, represented by the Director, Office of Research Contracts; individually, a "Party" and collectively, the "Parties."

Preamble:

WHEREAS, AUM is involved in conducting basic and applied research having impact on human health and cutting edge translational research in diversified fields.

Specific goals of AUM in the following areas are:

- **Bioprospecting:** Developing in-house microbial consortium through exploring natural resources such as microbes, bacteria, plants, and marine organisms from rare ecosystems for New Chemical Entities (NCES).
- **Bioactivity:** Screening extracts and purified compounds from selected resources for antimicrobial activities, however not limited to such individual screenings.
- **Medicinal Chemistry:** Purification, characterization, and elucidation of the structure and novelty of the active compounds, to study the metabolites profile of natural extract libraries for dereplication and to synthesize their derivatives.
- **Proteomics and Genomics:** Exploration of microbial genomes and proteomic analysis to determine the taxonomic diversity by molecular analysis of their genomes.
- **Astrobiology** - with special reference to research on life - Plant and cellular activity in space.
- **Plant Biotechnology.**
- **Molecular data science & System Biology.**

AUM has the expertise and facilities, including the sophisticated Common Instrumentation Facility ("CIF") and fully functional animal house that facilitates advanced stages of research in applied and medical science.

WHEREAS, the UNIVERSITY, specifically through Dr. Sadhana Ravishankar's laboratory in the School of Animal and Comparative Biomedical Sciences, focuses on researching practical solutions towards a significant reduction in human foodborne illnesses by improving food safety. Emphasis is on the use of natural products and processes for the food industry in order to provide safe and wholesome foods for the consumer, including microbiology testing services, molecular and biochemical testing, shelf-life testing, product evaluation and process validation. The two major research areas are - understanding the survival of foodborne pathogens in production environments; and controlling them using natural ways.

NOW THEREFORE, in consideration of the mutual covenants set forth above and other good and valuable consideration, AUM and UNIVERSITY hereby enter into this MOU to develop and expand a framework of cooperation to develop mutually beneficial programs, projects and activities (the "Cooperation").

Scope:

Both Parties agree to develop Cooperation activities in furtherance of this MOU. The two Parties, after considering their objectives and strengths, have agreed to cooperate in the following areas of mutual interest:

- Astrobiology research with relevance to natural products, plant & cell biology, plant biotechnology, drug discovery, etc.
- Prepare and submit collaborative proposals of mutual interest for funding.
- Technical consultancy activities in areas mutual interest.
- Mutual access to the other Party's instrumentation and testing facilities. Each Party is responsible for the cost of using the other Party's instrumentation and testing facilities.
- Organizing and participating in Joint Symposia / Conferences / Workshops/ Short-term Refresher courses conducted by both Parties.
- Exchange faculty for guest lectures and other research related activities.

Financial Support

It is understood that each Party shall be fiscally responsible for its own activities under this MOU. The pursuit of any of the Cooperation listed above shall depend upon the availability of resources and financial support of each Party.

Separate Agreements

This MOU is neither a fiscal nor a funds obligation document. Any endeavour or transfer of anything of value involving reimbursement or contribution of funds between the Parties to this MOU will be outlined in separate agreements that shall be made in writing by representatives of the Parties and shall be independently authorized by authorized representatives of each Party. This MOU does not provide such authority.

Intellectual Property

No rights to any intellectual property owned or developed by either Party are transferred to the other Party under this MOU.

Participation in Similar Activities

This MOU in no way restricts University or AUM from participating in similar activities with other public or private agencies, organizations, and individuals.

Duration

This MOU shall be valid for a period of three (3) years from the Effective Date, unless terminated by either Party in accordance with the Termination provision of this MOU. This MOU may be renewed for additional periods as may be mutually agreed upon in writing by both Parties.

Termination

This MOU may be terminated by either Party by giving three (3) months' notice in writing to the other Party. Either of the Parties shall honour, within a mutually agreed period, the outstanding commitments, if any, as on the date of termination. This MOU may be terminated by UNIVERSITY for lack of funding appropriated by the State of Arizona legislature. This MOU is also subject to cancelation for conflicts of interest on the part of

individuals negotiating agreements on behalf of the State of Arizona, in accordance with A.R.S. § 38-511.

Notices

All notices and other communications required to be served on AUM under the terms of this MOU, shall be considered to be duly served, if the same is delivered to AUM at its Office of the Vice-Chancellor, Amity University Maharashtra, Mumbai-410206 or sent by e-mail to provc@mum.amity.edu. Similarly, any notice to be given to the UNIVERSITY shall be considered as duly served, if the same is delivered to the UNIVERSITY OF ARIZONA, Office of Research Contracts, 888 N. Euclid Ave., Rm. 515, Tucson, AZ 85719-4824, USA or sent by e-mail to contracting@email.arizona.edu.

Arbitration

In the event of a dispute or difference between the Parties hereto, such differences will be resolved amicably by mutual consultation.

Modification

No modification to this MOU shall be binding unless made in writing and signed by both Parties.

Compliance

Each party agrees to be bound by their applicable rules governing equal employment opportunity, non-discrimination, and immigration.

Force Majeure

Any of the Parties hereto shall not be released from its obligations for any reason except for force majeure such as war, strike, fire, pandemic/endemic, acts of God or other causes beyond control of a Party or the Parties.



Disclaimer of Warranties and Limitation of Liability

NEITHER PARTY MAKES WARRANTIES OF ANY KIND, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT, REGARDING THE ACTIVITIES PURSUANT TO THIS MOU.

Public Statements; Use of Names and Logos

Neither Party is permitted to use the names, logos or other identifiers associated with the other Party without such Party's express prior written consent in each instance. Except as required by law, neither Party will issue any press release or other public statements in connection with this MOU without the other Party's prior written consent.

IN WITNESS WHEREOF, the Parties hereto have signed this, the Memorandum of Understanding the date of the last signature below.

<u>For and on behalf of</u> Amity University Maharashtra (AUM), India	<u>For and on behalf of</u> Arizona Board of Regents on behalf of the University of Arizona
	
Name: Dr. A. W. Santhosh Kumar	Name: Dr. Betsy Cantwell
Title: Pro Vice Chancellor	Title: Sr. VP for Research and Innovation
Date: 27 th October, 2021	Date: 27 th October, 2021

**MEMORANDUM OF UNDERSTANDING
ON ACADEMIC AND RESEARCH COLLABORATION**

Between

University of Cincinnati

And

Amity University, Maharashtra

This Memorandum of Agreement is entered into by and between **University of Cincinnati (UC)**, 2900 Reading Rd., Suite 460, Cincinnati, OH 45206-0829 and **Amity University, Maharashtra (AUM)**, Mumbai - Pune Expressway, Bhatan Post-Somathne, Panvel, Mumbai, Maharashtra 410206.

Recitals:

The **University of Cincinnati** is a state institution of higher education organized under Section 3361 of the Ohio Revised Code. The University of Cincinnati serves the people of Ohio, the nation, and the world as a premier, public, urban research university dedicated to undergraduate, graduate, and professional education, experience-based learning, and research. It is committed to excellence, diversity and an inclusive environment for students, faculty, staff, and all activities. Through scholarship, service, partnerships, and leadership, UC creates opportunity, develops educated and engaged citizens, enhances the economy and enriches the University, city, state and global community. The University of Cincinnati Cancer Center delivers the most advanced cancer care available for adults in Greater Cincinnati through expert teams, pioneering research and a spirit of collaboration.

AUM has been established under Maharashtra Govt. Act of 2014 of Government of Maharashtra and is recognized as per Section 2(f) of the UGC Act with the rights to confer degrees. AUM has expertise in various areas of science, engineering, architecture, design, humanities, law and management. **Amity Institute of Biotechnology (AIB)** is a constituent unit of Amity University Mumbai established in the year 2014, with the aim to promote research and development in the broader areas of biosciences and biotechnology. AIB has facilities that support innovative research in areas of plant biotechnology, environmental biotechnology, industrial biotechnology, microbiology & food Biotechnology, Structural & Computational Biology and Stem Cells and Regenerative Medicine.



Whereas, UC and AUM (each individually a 'Party' and collectively as 'Parties' hereinafter) are interested to take up a joint research programme / project pertaining to "Tumor cell Vaccine" as per the scope more specifically contained and detailed in Schedule – I annexed hereto.

The two institutions will encourage direct contact and co-operation between their faculty and scientists, Departments and Research Centres, within fields that are mutually acceptable and visits by and exchange of doctoral students, faculty members and scientists for research and courses.

The Parties hereto agree to the following terms and conditions for the above collaboration:

1. **Scope, Purpose of Activity:** The scope of the activity under this collaboration will be as contained and detailed in Schedule – I annexed hereto.
2. **Intellectual Property (IP):** Based on contributions from inventors of respective Party, knowledge and/or intellectual property (IP) which can be covered by patents and other IPRs will be filed by UC or AUM, on a case to case basis, based on contributions of each of the Parties and under mutually agreed to terms. Provided however, that either Party may make use of, all information and data generated during this collaborative activity hereunder for its own internal research and academic purposes. If there are any commercial benefits arising from the work, it should be shared by both the parties
3. **Publications:** Any research findings arising from this collaborative activity may be published / presented at national or international conferences as jointly authored. Acknowledgement of the contribution of the authors towards such publications will be made, as appropriate. However, the terms and conditions for such publications shall be mutually agreed upon.
4. **Confidentiality:** UC and AUM agree to hold in confidence all information/data designated as confidential, which is obtained/disclosed from either Party or created during the performance of this agreement and will not disclose the same to any third party without written consent of the other Party except as allowed under Article 3
5. **Non-Exclusive:** This relationship is on a non-exclusive basis and either AUM or UC are free to enter into other relationships or alliances with other partners.
6. **Term and Termination:** The term of this agreement shall be for a period of five (5) years from the date of execution hereof unless terminated earlier by a written notice of thirty (30) days, by a Party seeking such termination, to the other Party hereto.
7. **Changes:** Any changes / alterations to this agreement / understanding shall be made by the Parties hereto by mutual agreement, in writing, by the authorized representatives of both the Parties.
8. **Compliances:** Each Party agrees to perform its activities in compliance with all applicable statutes and regulations that are in force at that time.



9. **Dispute Resolution:** Any and all disagreements / differences / disputes arising hereunder shall be resolved amicably by the designated senior executives / officers of the good offices of both Parties.

AGREED



REGISTRAR
AMITY UNIVERSITY MUMBAI
MUMBAI - PUNE EXPRESSWAY
PANVEL - MUMBAI - 410 206

AUM

Name: Dr. Hira Vyas



Date: 13th April, 2021

University of Cincinnati

Name: *Geoffrey Pinski*

Title: *AUP, Tech Transfer*

Signature:



Date: *April 15, 2021*

Witness:

Name:

Witness:

Name:

Schedule – I:

Scope of collaboration

1. **Title of the Project:** An Engineered Tumor Cell Vaccine that Utilizes Distinct Osteopontin Domains to Maximize Immune Stimulation
2. **Team composition of Partnering Institutions:**

Dr. Vinoth Prasanna Gunasekaran, Assistant Professor, Amity Institute of Biotechnology, Amity University, Mumbai.

Dr. Georg F. Weber, Professor, College of Pharmacy, University of Cincinnati, USA.

3. **Summary of the proposed research project:**

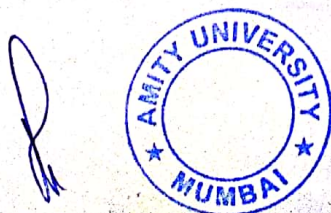
Background: Cancer vaccines that induce the immune system to eliminate cancer cell burden have emerged as a practical approach. It has become increasingly clear, however, that the outcome of cancer immunotherapy is decisively determined by the type of immune response induced. Our recent work has demonstrated the cytokine osteopontin to be a crucial regulator of type I and type II immunity. Osteopontin $-/-$ mice fail to mount protective type I immunity to bacterial or viral challenge, which is associated with diminished production of the stimulatory cytokine IL-12 and excessive production of the antagonistic cytokine IL-10. Induction of IL-12 and inhibition of IL-10 reflect differential engagement of macrophage receptors: Phosphorylation-dependent ligation of integrin $\alpha\beta 3$ by the N-terminal portion of osteopontin leads to IL-12 expression, while phosphorylation independent interaction of a C-terminal domain with CD44 mediates IL-10 suppression.

Objective/Hypothesis: Since osteopontin regulates type I immunity (through IL-12) and type II immunity (through IL-10) at a more proximal level than most other cytokines, there is reason to hypothesize that it may be a more potent adjuvant for anti-cancer vaccines than most of the currently used cytokines. The identification of two functional osteopontin domains, which independently regulate IL-10 and IL-12 secretion from macrophages, provides a unique opportunity to use these fragments to modulate the immune response to cancer vaccines. We hypothesize that the N-terminal domain, which induces IL-12 but does not suppress IL-10, will be more successful as a cancer vaccine adjuvant than the C-terminal domain, which selectively suppresses IL-10, or than the wild-type osteopontin.

Specific Aims:

1. Generation and testing of a tumor vaccine that secretes engineered osteopontin variants.
2. Definition of the cytokine profile induced by osteopontin transfectants in vivo.
3. Evaluation of the induction of cytotoxic T-lymphocytes by osteopontin transfectants in vivo.
4. Evaluation of the regulation of B-cell activation through osteopontin transfectants in vivo.

Study Design: The generation of cellular anti-cancer vaccines by transfection of cytokine genes into tumor cells followed by irradiation has been studied extensively in mice and has undergone some testing in humans. We will use the 4T1 murine breast cancer cells to generate



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irradiated cellular vaccines after transfection with osteopontin or genetically engineered variants of the cytokine. In particular, we will transfect a N-terminal deletion mutant that will engage integrin receptors and induce IL-12 but will not ligate CD44, so that IL-10 will remain high. The broad cytokine profile, comprising a combined Th1 and Th2 patterns, is expected to enhance the induced anti-tumor immune response more strongly than Th1 or Th2 cytokines alone. This hypothesis will be tested in our experiments.

Relevance: The proposed structure-activity analyses will allow a rational vaccine design that not only presents relevant antigens but also directs the immune system toward the most efficient mode of response. From these studies we will also learn more about the molecular regulation of cell-mediated versus antibody-mediated immunity which has implications for vaccines in general, autoimmune diseases, and organ transplantation.

