

REPORT

Report on participation of the ICMR International Fellow (ICMR-IF) in Training/Research abroad.

1. Name and designation of ICMR- IF : Dr. Pradeep Kumar Sharma,
Senior Scientist
2. Address : Food Drug and Chemical Toxicology Group
CSIR-Indian Institute of Toxicology
Research, Vishvigyan Bhawan, 31
Mahatma Gandhi Marg, PO Box no 80,
Lucknow-226001, U.P., India
3. Frontline area of research in which
training/research was carried out : Tissue Engineering and cancer biology
4. Name & address of Professor and host institute : Dr. Nasim Annabi
Chemical and Biomolecular Engineering
Department, 5531 Boelter Hall, University
of California Los Angeles (UCLA), Los
Angeles, California-90095, USA
5. Duration of fellowship with exact date : February 01, 2020 to October 20, 2020
6. Highlights of work conducted
 - i) Technique/expertise acquired : Biomaterial characterization techniques
such as Mechanical testing, Swelling Test,
Degradation assay, 3-D Bioprinting and
Bioink formulation, characterization and
Synthetic and natural Biomaterial synthesis
 - ii) Research results, including any papers,
prepared/submitted for publication :

Porcine/Fish GelMA based bioink were synthesized and characterized for bioprinting 3-D cancer model. Different concentrations of GelMA were evaluated for mechanical properties and biodegradability. Three concentrations (5, 10, and 15 %) of GelMA were prepared and compared for biodegradability, swelling potential and mechanical strength. GelMA bioink was biodegradable at all concentrations however; lower concentration GelMA was more readily degradable. On the other hand, none of the GelMA formulation swells much as a function of time. Further, mechanical strength of different formulation was evaluated to study the effect of increasing concentration on stiffness of biomaterial. The stiffness of biomaterial increases with increasing concentration of GelMA. Based on these preliminary results, 10% porcine GelMA was used further to characterize as a

suitable bioink. Extrusion based 3D bioprinter was used to print GelMA based 3 D structures. Two main concerns (temperature and pressure) were optimized for dispensing GelMA bioink. Temperature greatly affected the extrusion of GelMA bioink as spreading of ink was quite common during bioprinting. Temperature range between 18 to 15 °C allowed GelMA to dispense without spreading and structures were printed using integrated software with 3D bioprinter (Allevi-3).

Publications:

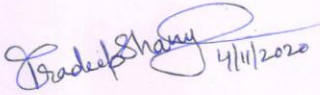
Research work is still under progress and will be submitted to peer reviewed journals upon completion of work at the host laboratory. In addition, one book chapter has been communicated and presently under review.

1. Book chapter submitted- Deepika Arora, Purna Pant and Pradeep Kumar Sharma .Trends in Functional Biomaterials in Tissue Engineering and Regenerative medicine (2020); Biomaterials in Tissue Engineering and Regenerative Medicine, Springer Nature Publisher. (Final acceptance will be updated in the due course of time)

iii) **Proposed utilization of the experience in India:**

Initiatives will be taken to develop 3D bioprinted vascularized tumor model to study metastasis, tumor microenvironment and drug efficacy evaluation platform. In addition, skill developed during the fellowship will be utilized for developing different 3D bioprinted models for various diseases models and toxicity evaluation platforms for laboratory and clinical applications. Students will be trained in 3D bioprinting for the development of relevant and functional in vitro models for various studies. 3D bioprinting based tools will help in formulation of translational research proposal in the future.

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 4/11/2020

Signature of ICMR-IF