PARBEEN SINGH

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Professional Summary

Energetic professional with a blend of creativity, passion for cancer therapy, polymeric pharmaceutical drug delivery, analytical chemistry, Photoresponsive therapy, Nanomedicine and polymeric biomaterials and molecular biology. A motivated researcher offering over 8 years' experience in the polymeric biomaterials, pharmaceutical analysis, primary cell culture, *in vivo* animal experiments, Microneedles based transdermal drug delivery, clinical research, GDM, metabolite isolation and quantification by LCMS-MS and clinical research. Focused on high standard of research quality, leadership, and learning skills.

Skills

Polymeric pharmaceutical drug carriers design and synthesis, Photoresponsive materials synthesis, Microneedles based transdermal drug delivery Fenton Chemistry, Nano drug carrier design and synthesis, MOF based carrier designing, Controlled drug delivery	Leadership, good communication skills Team management, and motivational speaker
Material characterizations techniques, (FTIR, NMR, TGA, DSC, UV-VIS-NIR, SEM, PXRD, HPLC, HPGPC, LC-MS, GC, IC, SEM-EDX, TEM), good hand in all chromatographic techniques, Isolation and quantification of metabolite by LC-MS on targeted and untargeted platform	Good commands on English, Hindi, Chinese, and Sanskrit, and Punjabi
Cancer cell therapeutics Isolation and cell culture of primary cells, Cell imaging, Cell toxicity assay, cellular uptake assay, and cellular metabolic assay, and determination of different metabolic product of the cells	Microsoft offices, Chem office, AI, Maya

In vivo cancer xenografting on mice, tumor content determination, biodistribution study of drug carriers (LC-MS, Fluorescence microscopy) Animal study of drug in rabbit	Good command software like Origin Pro, Image Pro, LAS X, Photoshop and MestRe, Analyst and Graph Pad Prism

Work experience

Senior Postdoc researcher Department of biomedical engineering, University of Connecticut, Storrs Campus, Connecticut, USA	09/2021- Continue
Senior Project Associate Translation Health Science and Technology Institute (THSTI) NCR Biotech Science Cluster, Faridabad, Haryana, India	01/2021- 08/2021
Postdoc Researcher Sun Yat-Sen University Guangzhou, China	11/2018- 11/2020
Visiting Postdoc researcher Postdoc Innovation Practice Base of Shenzhen Polytechnic Professor Shine (Xu Zhang) group, Shenzhen, China	11/2018- 11/2020
Research Scholar (Ph.D.) Shanghai Institute of Materia Medica, Shanghai (China) Professor Jiwen Zhang group, (SIMM, CAS), China	09/2015- 07/2018
Senior Officer Sun Pharmaceutical Ltd., Mohali, (India)	02/2015-09/2015
Senior Research Chemist Nectar Lifesciences Ltd., Chandigarh, (India)	10/2013-02/2015
Trainee Chemist Sharon Biomedicine Pvt. Ltd., Dehradun, (India)	12/2012-06/2013

Education

Doctor of Philosophy (PhD) in Pharmaceutics Shanghai Institute of Materia Medica, Chinese Academy of Sciences, 555 Zuchongzhi Rd, Pudong, Shanghai, China, 201203 Under supervision of Prof. Jiwen Zhang (http://sourcedb.simm.cas.cn/yw/zjrcyw/201112/t20111205_3408081.html)	2015-2018

Master in Pharmaceutical Chemistry 2011-2013
HNBGU Central university, Srinagar Garhwal, India
Department of Pharmaceutical Chemistry, Chauras Campus Srinagar
Uttarakhand, India, 246174
(https://www.hnbgu.ac.in/school/science/pchemistry/srinagar/faculty-staff)

B.Sc. 2008-2011
HNBGU Central university,
BCC campus, Srinagar Pauri Garhwal, Uttarakhand, India, 246174

Project Undertaken

1. Synthesis of advanced MNs for photoresponsive epidermoid cancer therapy and controlled drug delivery (As a postdoc at Shenzhen Postdoc Innovation Practice base)

Polymeric microneedle (MN) systems are interesting transdermal drug delivery systems because of their controlled drug delivery, tunable properties, and ease of patient self-administration. They are biocompatible and can easily and painlessly penetrate the stratum corneum, delivering their contents into the dermis where they can be adsorbed into systemic circulation. Polymeric MNs can facilitate appropriate therapeutic dosing by controlling the release kinetics of pre-loaded drugs, targeting specific tissues, or responding to changing physiological conditions. In this research are developing a photosensitive MNs for epidermoid cancer and antifungal infections

Status: One review article and one research article have been published as a first author another two are under evaluation

DOI: https://doi.org/10.1016/j.jconrel.2019.10.022, DOI: https://doi.org/10.1021/acsami.1c12235

2. In vivo biodistribution drug delivery study of MNs by LC-MS (As a postdoc at Sun Yat-Sen University)

Microneedle technology is the emerging platform in the field of biomedical engineering so it was very important to investigate the pharmacokinetic profile of this technology. To do so, we developed a rapid and sensitive liquid chromatography-tandem mass spectrometric method and validated for the determination of HA15, an emerging anticancer compound targeting GSPA5/BIP delivered by dissolvable polymeric microneedles. The linear range of quantification for HA15 was 2.5–1000 ng/ml in plasma and tissue homogenate and the limit of detection and lower limit of quantification are 1 and 2.5 ng/ml, respectively. HA15 was extracted from mouse plasma and organs using protein precipitation and using dabrafenib as an internal standard and the drug was stable under relevant analytical conditions. The method was used to analyze drug loading, dissolution in vitro, and release ex vivo from dissolvable polymeric microneedles and used to compare these materials to subcutaneous injection for the tissue distribution in tumor bearing nude mice.

Status: The research has been published as a first author DOI: https://doi.org/10.1016/

j.jpba.2020.113230

3. **Cyclodextrin-biomolecules based advanced polymer for targeted cancer therapy (As a PhD student at SIMM)**

Fabrication of supramolecular host in combination biomolecules is an interesting idea in modern drug delivery for development of new polymer with advanced chemical and biological properties. In this project we synthesized two hyper-crosslinked copolymer from cyclodextrin (CD); first one we fabricated from the CD sialic acid (SA) and second one was from CD and hyaluronic acid and explored for advance drug delivery applications. The as-synthesized copolymers have complexation properties, which could cover the drug within the structure and deliver to the site of action. The well-known inclusion capability of b-CD and targeted efficacy of biomolecules made it more appropriate for targeted drug delivery. The copolymer was characterized and explored for biomedical applications.
Status: Three research articles have been published and one is under review as a first author.
DOI: https://doi.org/10.1016/j.arabjc.2017.11.011

DOI: https://doi.org/10.1016/j.ijpharm.2020.119542.

4. **Surface modification of Cyclodextrin nanosponges for advanced drug delivery applications (As a PhD student at SIMM)**

Cyclodextrins nanosponges are highly microporous crosslinked polymers with potential applications in the delivery of small and macro-molecular therapeutic agents. Despite the potent host-guest inclusion property, their inherent lack of cellular binding ability has limited applications in drug delivery. So in this project, we functionalized the surface of β-cyclodextrin nanosponges with cholesterol, which is endogenous physiological molecules, widely distributed in all cells, and responsible for cell interactions and protein binding. After grafting, β-CD-NSP was found to be safe in cytotoxicity assay. Doxorubicin was selected as a model drug for drug adsorption study of cholesterol hydrogen succinate grafted β-CD-NSP. The cellular uptake of NSP was found to be enhanced after CHS modification confirmed by confocal laser scanning microscopy. Thus, proposed CHS modified β-CD-NSP system could be used as a site-specific drug delivery carrier.
Status: research has been published in Carbohydrate Polymers as a first author,
DOI. https://doi.org/10.1016/j.carbpol.2018.02.044)

5. **Evaluation of edible Garhwal Himalayas medicinal plant for nutraceutical applications (As a master student at HNB Garhwal University)**

The Himalayan region is one of the most diverse place and epicenter for traditional Ayurveda medicinal system. In this project we evaluated the nutritional profile, anti-nutritional value, mineral value, successive value, TLC analysis and phytochemical screening of wild edible fruit of *Grevia Oppositifolia* were investigated by standard method. The fruits have been found to rich in nutrients and minerals such as crude protein, carbohydrates, crude fiber, ash content (3.12%, 22.14%, 16.0% and 4.20%) and minerals as calcium, magnesium, potassium and phosphorus (5.75, 2.98, 1.18 and 0.50 mg/100gm) respectively and phytochemical screening of plant for the presence of glycosides, flavonoids, phenols, resin and tannins. This analysis revealed that the fruits contained higher value of fat, protein, fiber and minerals as compared to the cultivated fruits with berry and 200 g fruits contain sufficient amount of nutrients required per day by a person.
Status: Research has been published in the Asian journal of Science and Technology

Publications

1. **P Singh**, B. Youden, Y. Yang, Y. Chen, A. Carrier, S. Cui, R. Jiang, K. Oakes, M. Servos, and X. Zhang*. Synergistic multimodal cancer therapy using glucose oxidase@CuS nanocomposites **ACS Applied Materials and interface (IF=9.3), 13, 35 (2021), 41464-41472.** https://doi.org/10.1021/acsami.1c12235.

2. **P. Singh**, A. Carrier, Y. Chen, S. Lin, J. Wang, S. Cui, X Zhang. Polymeric microneedles for controlled transdermal drug delivery. **Journal of Controlled Release (IF=7.90)**, 315 (2019) 97–113. https://doi.org/10.1016/j.jconrel.2019.10.022.

3. **P. Singh**, R. Xiaohong, T. Guo, L. Wu, S. Shakya, Y. He, C. Wang, A. Maharjan, V. Singh1, J. Zhang*. Biofunctionalization of β-cyclodextrin nanosponges using cholesterol. **Carbohydrate Polymers (IF=7.20) 2018, 190, 23-30.** https://doi.org/10.1016/j.carbpol.2018.02.044.

4. **P. Singh,** R. Xiaohong, Y. He, L. Wu, C. Wang, H. Li, V. Singh, J. Zhang*. Fabrication of β-cyclodextrin and sialic acid copolymer by single pot reaction to site specific drug delivery. **Arabian Journal of Chemistry (IF=4.76), 2020, 13, 1397-1404.**

https://doi.org/10.1016/j.arabjc.2017.11.011.

5. **P. Singh**, L. Wu, R. Xiaohong, Z. Wei, Y. Tang, C. Andrew, X. Zhang and J. Zhang. Hyaluronic-acid-based β-cyclodextrin grafted copolymers as biocompatible supramolecular hosts for tocopherol drug delivery. **International Journal of Pharmaceutics (4.85), 2020, 586, 119542.** https://doi.org/10.1016/j.ijpharm.2020.119542.

6. **P. Singh**, L. Wu, Y. Chen, X. Ren, J. Feng, A. Carrier, Y. Tang, X. Zhang, and J. Zhang. β-Cyclodextrin-grafted hyaluronic acid as a supramolecular polysaccharide carrier for targeted drug delivery. **International Journal of Pharmaceutics (4.85), 2021, 6021 120602.** https://doi.org/10.1016/j.ijpharm.2021.120602

7. **P. Singh**, X. Zeng, X. Chen, Y. Yang, Y. Chen, S. Cui, A. Carrier, K. Oakes, T. Luan, X. Zhang. Quantitation of polymeric-microneedle-delivered HA15 in tissues using liquid chromatography-tandem mass spectrometry. **Journal of Pharmaceutical and Biomedical Analysis (IF=3.2), 2020, 185,113230**. https://doi.org/10.1016/j.jpba.2020.113230

8. Y. Chen, Y. Yang, Y, Xian, **P. Singh,** J. Feng, S. Cui, A. Carrier, K. Oakes, T. Luan, X. Zhang. Multifunctional Graphene-Oxide-Reinforced Dissolvable Polymeric Microneedles for Transdermal Drug Delivery. **ACS Applied Materials and interface (IF= 8.4),** 2020, 12 (1), 352-360.

https://doi.org/10.1021/acsami.9b19518.

9. V. Singh, Y. He, C. Wang, J. Xu, X. Xu, **P. Singh**, H. Li, P. York, L. Sun, J. Zhang*. A comparison report of three advanced methods for drug-cyclodextrin interaction measurements. **Journal of Pharmaceutical and Biomedical Analysis (IF=3.2), 2017, 134, 252-258.**

http://dx.doi.org/10.1016/j.jpba.2016.11.037.

10. J. Xu, V. Singh, X. Yin, **P. Singh,** L. Wu, X. Xu, T. Guo, L. Sun, S. Gui, J. Zhang*. Solvents effects on crystallinity and dissolution of b-artemether. **Drug Development and Industrial Pharmacy (2.3) 2017, 3, 372-378,** https://doi.org/10.1080/03639045.2016.1253728.

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1. CAS-TWAS-2015 fellowship awardee
2. Shenzhen government postdoc funding (Grant number - 6019330006K)

References

1. Prof. Jiwen Zhang, Center for Drug Delivery Systems, Shanghai Institute of Materia Medica, Chinese Academy of Sciences, No. 501 of Haike Road, Shanghai 201203, China; Tel/Fax: +86-21-20231980; E-mail: jwzhang@simm.ac.cn.

2. Prof. Xu Zhang, Verschuren Centre for Sustainability in Energy and the Environment, Cape Breton University, 1250 Grand Lake Road, Sydney, Nova Scotia, B1P 6L2, Canada.

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