**To**

**The Office of Sun Pharma Science Foundation**

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Dear Sir,

◊ **Signed Citation on outstanding research work by the nominator**

**New Knowledge Generation (*Medicinal Chemistry for Affordable healthcare)***

Experience of collaborating with diverse biologists and published papers in the therapeutic areas of bacterial infection, tuberculosis, malaria (*Free Radical Biology & Medicine*, **2012**, *53*, 129-42, *Antimicrobial Agents and Chemotherapy,* **2008,** *52*, 705–715, **Eur J Med Chem Volume 242, 15 November 2022, 114639; https://doi.org/10.1016/j.ejmech.2022.114639,** Current Medicinal Chemistry 30 (8), 974-998. doi: 10.2174/0929867329666220823111812, ACS Omega 2020, 5, 1, 19–30. https://doi.org/10.1021/acsomega.9b03090, *European Journal of Medicinal Chemistry*, 95, **2015**, 357-368 http://dx.doi.org/10.1016/j.ejmech.2015.03.036), cancer and autophagy (**J. Med. Chem. 2021, 64, 16293−16316,** European Journal of Medicinal Chemistry, 2020, 188, 112011, ChemMedChem 2023 Mar 1;18(5):e202200617), Alzheimer's disease (*ChemMedChem 2015, 10, 1467-1474*, Bioorg Med Chem. 2019 Mar 15;27(6):895-930 (cover page), Anti-ischemic and antithrombotic Agents (*European Journal of Medicinal Chemistry*. **2010,** *45*, 1964–1971, *Bioorganic & Medicinal Chemistry Letters* **2010,** *20*, 244–247) with the objective of affordable healthcare to the society

- Filed patents (0209NF2020- Application number 202111003021 dated 21.01.2021, 0210NF2020- Application number 202111015502 dated 31.03.2021) on process routes for two off-patented drugs (having no suppliers in India) like Almitrine and Ifenprodil which are at Phase III trials as repurposed drugs for Covid-19 by industries of France and UK. **Collaborative MoU has been signed with Reliance Rasayan Private Limited (RRPL), Ahmedabad, Gujrat and technology has been transferred to them to commercialize new process routes of off-patented drugs (having no suppliers in India) like Almitrine and Ifenprodil**. DCGI has given permission for Phase II trial of

two re-positioned molecules (Almitrine, Ifenprodil) for ALI including covid-19 patients.

- **Discovered new process routes for block buster anti-cancer drugs Nintedanib and Olaparib, Patent has been filed (IN 202211006560 Date of filing 07/02/2022, IN 202211013919, 14/03/2022,** Chemistry Select accepted**) and CDA with Dr. Reddy's Laboratories, Hyderabad, Telangana, India has been done. Similarly, talks are undergoing to transfer the technology of Olaparib to suitable companies**
- **Corannulene Containing Unnatural α-Amino Acids and Amphipathic Peptides: Synthesis, Conformational Studies and Antibacterial Activities having Synergistic Effects with Rifampicin.** First use of corannulene in the field of biomedical research as possible antibacterial agents having membrane disrupting properties with synergistic behavior
- **Tyrosine-Derived Novel Benzoxazine Active in Rat Syngenic Mammary Tumor Model of Breast Cancer, (J. Med. Chem. 2021, 64, 16293−16316 10.1021/acs.jmedchem.1c01624).** Tyrosine-derived novel benzoxazine regressed tumor growth at concentration of 5 mg/Kg and 20 mg/Kg better than tamoxifen without any mortality in rat syngenic mammary tumor model.
- Conceptualized trisubstituted methane S006-830 as antitubercular agents with CFU count of 2.2 x $10^7$ with comparable efficacies to ethambutol and PZA. It also showed potent bactericidal activity against multi-drug resistant and single-drug resistant clinical isolates of M. tuberculosis (Chemical Biology & Drug Design 15 August 2021, Bioorganic Chemistry, 2020, 99, 103775, ACS Omega 2020, 5, 1, 19–30, European Journal of Medicinal Chemistry, 95, 2015, 357-368, Bioorganic & Medicinal Chemistry Letters, 2008, 18, 289-292, **Eur J Med Chem accepted; https://doi.org/10.1016/j.ejmech.2022.114639, Chemical Biology & Drug Design 15 August 2021 https://doi.org/10.1111/cbdd.13934**
- **New Spisulosine Derivative Promotes Robust Autophagic Response to Cancer Cells;** Eur J Med Chem, 2020, 188, 112011; https://doi.org/10.1016/j.ejmech.2019.112011. Our most potent molecule in a series of 16 synthesized derivatives showed robust autophagic cell death in diverse cancer cells sparing normal counterpart. Compound 26b mediated lethal autophagy induction was confirmed by formation of characteristic autophagic vacuoles, LC3 puncta formation, upregulation of signature autophagy markers like Beclin and ATG family proteins

***Basic Research***

- Enhancing the versatility of para-quinone methide chemistry for the synthesis of new bioactives, natural product mimics and drug like molecules as exemplified by Synthesis of Bedaquiline (TMC 207) like molecules to combat multidrug-resistant (MDR) tuberculosis with reduction of steps. Direct installation of three crucial aryl rings in hydroacylation giving rise to α-disubstituted aryl ketone can provide a series of

bedaquiline analogs (***Chem. Commun., 2022, 58, 6160-6175*** **, https://doi.org/10.1039/D2CC00838F,** Journal of Molecular Structure Volume 1239, 5 September 2021, 130493; https://doi.org/10.1016/j.molstruc.2021.130493, Journal of Organic Chemistry 2022, 87, 12, 7696-7711, Chem Asian J. 2023, Volume18, Issue 4, e202201129)

- Base mediated 1,6- Aza-Michael addition of heterocyclic amines and amides to p-QMs leading to Meclizine, Hydroxyzine and Cetirizine like architectures. Synthesis 2019, 51, 4434-4442 (10.1055/s-0039-1690677)
- Conceptualized new kind of steroidomimetics utilizing chiral amino acids. Tyrosine-derived benzoxazine lead regressed tumor growth at 5mg/Kg and 20mg/Kg without causing any mortality in rat syngenic mammary tumor model (J. Med. Chem. 2021, 64, 16293−16316, European Journal of Medicinal Chemistry 133 (2017) 139-151, Bioorganic & Medicinal Chemistry 25 (2017) 4452–4463, Eur J Org Chem 2014, 36, 8004–8019, RSC Adv., 2013, 3, 19533-19544, Tetrahedron Report, 2013, 69, 2853-2884, Organic Biomolecular Chemistry; 2007, 5, 360-366)
- Synthesized diverse natural products and related diversity like potent inhibitor of protein kinase C (-)-Balanol and antifungal antibiotic Ophiocordin (Chem. Eur. J, 2008, 14, 4675-4688), nicotinic agonists (+)-epiquinamide and (+)-α- conhydrine (Tetrahedron 2009, 65, 5322-5327), antimitotic $C_3$-*epi*-(+)-lycoricidine (Tetrahedron Letters, 2015, 56, 146-149), Jaspine B (RSC Adv., 2013, 3, 16795-16801), potent inhibitor of glucosidase enzymes 8,8a-diepicastanospermine and (-)-Swainsonine (Tetrahedron, 70, 2014, 1363-1374, RSC Adv., 2014, 4, 2161-2166), antibacterial levofloxacin (Tetrahedron Letters, 2009, 50, 4703-4705) and piperazinomycin (Chem-Asian J. 2011, 6, 189-197), antimalarial (─)-Raphidecursinol B (Eur. J. Org. Chem. 2010, 5100-5107), novel antitumoral of marine origin spisulosine and Plinabulin, Psammaplin (Tetrahedron, 2010, 66, 9304-9309, Journal of Molecular Structure, 2021, 1229, 129830, Journal of Molecular Structure; 2021, 1225, 129173), Hetero [6-5-6] tricyclics resembling Taiwaniaquinoids (Org Biomol Chem, 2009, 7, 1858-1867, Org Biomol Chem 2011, 9, 4782-4790 (cover page)
- Critically evaluated Amino acids and Non-amino acids based synthetic approach towards bioactive natural products (Results in Chemistry 3, 2021, 100215, Chemistry A European Journal; 2020, 26, 5131-5156, Natural Product Reports under review)
- Metal free synthesis of dearylated drugs like Lasofoxifene and centchroman (Eur J Org Chem, 2019, 753-758)

**Impact on Nation**-

- During pandemic period, reposition of molecules for the treatment of covid-19 patients have been investigated. **Process of two molecules like almitrine and ifenprodil have been completed and patent filed. Technology transferred to RRPL, Hyderabad. DCGI has given permission for Phase II trial of two re-positioned molecules (Almitrine, Ifenprodil) for ALI including covid-19 patients**
- **To make affordable health care for cancer patients, two new process routes of block buster drugs like Nintedanib and Olaparib have been completed, patent filed and CDA have been signed among industries and CDRI**. Talks to transfer the technology is ongoing.

**Impact on Society**-

- **IND development of Almitrine and Ifenprodil for covid-19 has direct relevance for the society**.
- **New process route of Nintedanib and Olaparib may reduce the cost of preparation of these drugs in India when they will be synthesized at pilot scale at industries**

**Impact on Industry**-

- **His identified process route could help in synthesizing 100 gram scale of Almitrine and ifenprodil at Reliance rasayan Private Limited (RRPL), Ahmedabad. CDRI was able to file IND dossiers to DCGI for which Phase II permission has been obtained**.

**Impact on Environment**-

Developed synthetic strategies via cascade or metal-free routes for dearylated lasofoxifene and Centchroman which resulted in environmentally benign alternatives

In the last twenty one years of independent research, Dr. Panda has published 128 papers, which received around 3286 citations with h-index of 31 (https://scholar.google.co.in/citations?user=YwJvoiIAAAAJ&hl=en). He has guided 20 doctoral students and is inventor of seven patents. Many of his former doctoral students are holding academic and scientist position in research institutions and industries of India and abroad. He received Bronze medal from Chemical Research Society of India (CRSI) in 2012 and accepted JSPS invitation and Bridge fellowship from Japan. He is a fellow of West Bengal Academy of Science & Technology (FAScT) and is a member of National Academy of Sciences, Allahabad (MNASc).