

CHANDER SINGH DIGWAL, Ph.D.

Program in Chemical Biology, Mortimer B. Zuckerman Research Center,

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Education

PhD in Medicinal Chemistry 2012-2017

National Institute of Pharmaceutical Education and Research (NIPER)-Hyderabad, TG, India

Master of Science in Pharmacy (Medicinal Chemistry) 2010-2012

National Institute of Pharmaceutical Education and Research (NIPER)-Ahmedabad, GJ, India

Bachelor of Pharmacy 2006-2010

Mohal Lal Sukhadia University, Udaipur, RJ, India

Research Experience

Postdoctoral Researcher**Research Associate****2021- Present****Research Fellow****2018-2021**

Program in Chemical Biology, Mortimer B. Zuckerman Research Center

Memorial Sloan Kettering Cancer Center, New York, NY, USA

Supervisor: Dr. Gabriela Chiosis

- Develop synthetic routes for small molecule inhibitors of Hsp90/Grp94/Hsp70-incorporating epichaperomes.
- Perform synthesis, purification, and characterization of target molecules and establish structure-activity/kinetic relationships.
- Develop radiolabeled epichaperome-based chemical probes for PET imaging and autoradiography.
- Develop fluorophore-conjugated or clickable epichaperome probes for flow cytometry, confocal microscopy and IVIS Imaging.
- Develop biotin and affigel-conjugated epichaperome probes for affinity purification.
- Formulation development, in vivo efficacy, biodistribution and pharmacokinetic analysis for epichaperome inhibitors.

Graduate Research Assistant**2012 - 2018**

National Institute of Pharmaceutical Education and Research (NIPER)-Hyderabad, TG, India

Supervisor: Dr. Ahmed Kamal

- Developed Vanadium-catalyzed synthetic methodologies for imides, amides, benzimidazoles, benzothiazoles, quinoxalines, and tetrazoles.
- Established synthetic route for potentially bioactive molecules followed by structure-activity relationship studies, and structure optimization.
- Designed and synthesized imidazo[1,2-a]pyridine-thiazole/thiophene hybrids as NF- κ B inhibitors, 2-morpholino-4-phenylthiazol-5-yl acrylamide derivatives as non-sulfonamide class of carbonic anhydrase inhibitors, and curcumin inspired indole/imidazo[1,2-a]pyridine analogues as tubulin polymerization inhibitors.

Honors and Scholarships

- 2012 – 2017** NIPER Fellowship for Ph.D. in Medicinal Chemistry from Ministry of Chemical and Fertilizers, Govt. of India
- 2012** Gold Medal for securing 1st rank in the Department of Medicinal Chemistry, NIPER-Ahmedabad.
- 2010 – 2012** NIPER Fellowship for M. S. Pharm. in Medicinal Chemistry from Ministry of Chemical and Fertilizers, Govt. of India.
- 2012** Qualified Council of Scientific & Industrial Research-National Eligibility Test (CSIR-NET), June 2012 in Chemical Sciences for Lectureship
- 2010** Qualified Graduate Pharmacy Aptitude Test (GPAT)–2010 conducted under the aegis of All India Council for Technical Education (AICTE)–2010 by M. S. University of Baroda, Vadodara
- 2006** Qualified Rajasthan Pre Entrance Test for Engineering, Architecture and Pharmacy (RPETEAP) in 2006

Scientific Skills/Technical Exposure

Organic synthesis and Purification: Expert in carrying out various organic reactions including air and moisture sensitive reagents/reactions, multi-step organic synthesis, designing and synthesis of small molecule inhibitors for drug discovery, designing synthetic routes for new classes of compounds, development of methodologies for organic synthesis, solving challenging synthetic problems and structure-activity relationships (SARs) analysis. Excellent skills in purification of organic compounds using chromatography, crystallization, and distillation as well as preparative TLC techniques.

Instrumentation: Flash Chromatography, ¹H NMR, ¹³C NMR, FT-IR, HPLC and Mass spectroscopy.

Biological studies: Working experience in cell culture techniques, cytotoxicity evaluation studies (MTT, Alamar Blue, ATPase assay), FP assay, PAMPA-BBB assay, InCuCyte cell proliferation experiments, Immunohistochemistry, In-gel fluorescence, Western Blot and Click-chemistry cell labeling etc.

Computational chemistry: Basic understanding of Molecular Modelling Software's such as Schrödinger suite, Sybyl x1.3, Autodock, and Molinspiration etc. (Working experience in Energy minimization, Conformational analysis, Protein minimization, Molecular docking, 3D QSAR studies and Molecular properties calculations)

Computer proficiency: Proficient in MS-Power Point, Excel, Word, and scientific data retrieval from various Internet portals using databases such as SciFinder, Reaxys, ScienceDirect, PubMed, Google Scholar, and Patent database USA (USPTO), India (IPINDIA), Europe (ESPACENET) etc. Good knowledge of application software's viz., ChemDraw, Reference Management Software (EndNote plus), Bruker-TopSpin, MestReNova etc.

Scientific writing: Capable of preparation of lab reports, research proposals, manuscript for publications, patents, and posters.

Publications/Poster/Conferences

Research Papers

- Sharma, S.; Kalidindi, T.; Joshi, S.; **Digwal, C. S.**; Panchal, P.; Burnazi, E.; Lee, S. G.; Pillarsetty, N.; Chiosis, G. Synthesis of 124I-labeled epichaperome probes and assessment in visualizing pathologic protein-protein interaction networks in tumor bearing mice, *STAR Protocols*, 2022, 2, 101318.
- Joshi, S.; Gomes, E. D.; Wang, T.; Corben, A.; Taldone, T.; Gandu, S.; Chao Xu, C.; Sharma, S.; Buddaseth, S.; Yan, P.; Chan, L. Y. L.; Gokce, A.; Rajasekhar, V. K.; Shrestha, L.; Panchal, P.; Almodovar, J.; **Digwal, C. S.**; Rodina, A.; Pillarsetty, N.; Miclea, V.; Peter, R. I.; S. D.; Tang, L.; Mattar, M.; de Stanchina, E.; Yu, K. H.; Lowery, M.; Grbovic-Huezo, O.; O'Reilly, E. M.; Janjigian, Y.; Healey, J. H.; Jarnagin, W. R.; Allen, P. J.; Sander, C.; Erdjument-Bromage, H.; Neubert, T. A.; Leach, S. D.; Chiosis, G. Pharmacologically controlling protein-protein interactions through epichaperomes for therapeutic vulnerability in cancer. *Commun. Biol.* 2021, 4,1333. **(IF: 6.268)**

- 3) Bolaender, A.;[‡] Zatorska, D.;[‡] He, H.;[‡] Joshi, S.;[‡] Sharma, S.;[‡] **Digwal, C. S.**;[‡] Patel, H. J.; Sun, W.; Imber, B. S.; Ochiana, S. O.; Patel, M. R.; Shrestha, L.; Shah, S. K.; Wang, S.; Karimov, R.; Tao, H.; Patel, P.D.; Martin, A. R.; Yan, P.; Panchal, P.; Almodovar, J.; Corben, A.; Rimner, A.; Ginsberg, S. D.; Lyashchenko, S.; Burnazi, E.; Ku, A.; Kalidindi, T.; Lee, S. G.; Grkovski, M.; Beattie, B. J.; Zanzonico, P.; Lewis, J. S.; Larson, S.; Rodina, A.; Pillarsetty, N.; Tabar, V.; Dunphy, M. P.; Taldone, T.; Shimizu, F.; Chiosis, G. Chemical tools for epichaperome mediated interactome dysfunctions of the central nervous system. *Nat. Commun.* 2021, 12, 4669. [‡]**Equal First Authors (IF: 14.92)**
- 4) Yadav, U.; Sakla, A. P.; Tokala, R.; Nyalam, S. T.; Khurana, A.; **Digwal, C. S.**; Talla, V.; Godugu, V.; Shankaraiah, N.; Kamal, A. Design and Synthesis of 5-Morpholino-Thiophene-Indole/ Oxindole Hybrids as Cytotoxic Agents. *ChemistrySelect* 2020, 5, 4356-4363. (IF: 2.109)
- 5) Swain, B.; **Digwal, C. S.**; Angeli, A.; Alvalaa, M.; Singh, P.; Supuran, C. T.; Arifuddin, M. Synthesis and exploration of 2-morpholino-4-phenylthiazol-5-yl acrylamide derivatives for their effects against carbonic anhydrase I, II, IX and XII isoforms as a non-sulfonamide class of inhibitors. *Bioorg. Med. Chem.* 2019, 21, 115090. (IF: 3.641)
- 6) **Digwal, C. S.**; Yadav, U.; Ramya, P. V. S.; Swain, B.; Kamal, A. Vanadium-Catalyzed *N*-Benzoylation of 2-Aminopyridines Via Oxidative C(CO)–C(CO) Bond Cleavage of 1,2-Diketones, *N*→*N* Aroyl Migration and Hydrolysis of 2-(Diaroylamino)Pyridines. *Asian J. Org. Chem.* 2018, 7, 865–869. (IF: 3.319)
- 7) Ramya, P.V.S.; Guntuku, L.; Angapelly, S.; Karri, S.; **Digwal, C. S.**; Babu, B.N.; Naidu, V.G.M.; Kamal, A. Curcumin inspired 2-chloro/phenoxy quinoline analogues: Synthesis and biological evaluation as potential anticancer agents. *Bioorg. Med. Chem. Lett.* 2018, 28, 892-898. (IF: 2.823)
- 8) Ramya, P.V.S.; Angapelly, S.; **Digwal, C. S.**; Yadav, U.; Babu, B.N.; Kamal, A. An efficient RuCl₃·H₂O/l₂ catalytic system: a facile access to 3-arylimidazo[1,2-*a*]pyridines from 2-aminopyridines and chalcones. *J. Saudi Chem. Soc.* 2018, 22, 90-100. (IF: 3.932)
- 9) Ramya, P.V.S.; Guntuku, L.; Angapelly, S.; **Digwal, C. S.**; Lakshmi, U.J.; Babu, B.N.; Naidu, V.G.M.; Kamal, A. Synthesis and biological evaluation of curcumin inspired imidazo[1,2-*a*]pyridine analogues as tubulin polymerization inhibitors. *Eur. J. Med. Chem.* 2018, 143, 216-231. (IF: 6.51)
- 10) Ramya, P.V.S.; Angapelly, S.; Angeli, A.; **Digwal, C. S.**; Arifuddin, M.; Babu, B.N.; Supuran, C.T.; Kamal, A. Discovery of curcumin inspired sulfonamide derivatives as a new class of potent carbonic anhydrase isoforms I, II, IX and XII inhibitors. *J. Enzyme Inhib. Med. Chem.* 2017, 32, 1274-1281. (IF: 4.31)
- 11) Vasu, K. K.;[‡] **Digwal, C. S.**;[‡] Pandya, A. N.;[‡] Pandya, D. H.; Sharma, J. A.; Patel, S.; Agarwal, M.[‡] Imidazo[1,2-*a*]pyridines linked with thiazoles/thiophene motif through keto spacer as potential cytotoxic agents and NF-κB inhibitors. *Bioorg. Med. Chem. Lett.* 2017, 27, 5463–5466. [‡]**Equal First Authors. (IF: 2.823)**
- 12) **Digwal, C. S.**; Yadav, U.; Ramya, P.V.S.; Sana, S.; Swain, B.; Kamal, A. Vanadium-catalyzed oxidative C(CO)–C(CO) bond cleavage for C–N Bond formation: one-pot domino transformation of 1,2-diketones and amidines into imides and amides. *J. Org. Chem.* 2017; 82, 7332–7345. (IF: 4.354)
- 13) Ramya, P.V.S.; Angapelly, S.; Babu, B.N.; **Digwal, C. S.**; Nagarsenkar, A.; Gannaju, S.; Prasanth, B.; Arifuddin, M.; Kanneboina, K.; Rangan, K.; Kamal, A. Metal-free C–C bond cleavage: one-pot access to 1,4-benzoquinone-linked *N*-formyl amides/sulfonamides/carbamates using Oxone. *Asian J. Org. Chem.* 2017, 6, 1008-1013. (IF: 3.319)
- 14) Ramya, P.V.S.; Angapelly, S.; Guntuku, L.; **Digwal, C. S.**; Babu, B.N.; Naidu, V.G.M.; Kamal, A. Synthesis and biological evaluation of curcumin inspired indole analogues as tubulin polymerization inhibitors. *Eur. J. Med. Chem.* 2017, 127, 100–114. (IF: 6.51)
- 15) Ramya, P.V.S.; Angapelly, S.; Rani, R.S.; **Digwal, C. S.**; Kumar, C.G.; Babu, B.N.; Guntuku, L.; Kamal, A. Hypervalent iodine(III) catalyzed rapid and efficient access to benzimidazoles, benzothiazoles and quinoxalines: biological evaluation of some new benzimidazole-imidazo[1,2-*a*]pyridine conjugates. *Arab. J. Chem.* 2017; <http://dx.doi.org/10.1016/j.arabjc.2017.02.007>. (IF: 5.165)
- 16) **Digwal, C. S.**; Yadav, U.; Sakla, A.P.; Ramya, P.V.S.; Aaghaz, S.; Kamal, A. VOSO₄-catalyzed highly efficient synthesis of benzimidazoles, benzothiazoles and quinoxalines. *Tetrahedron Lett.* 2016, 57, 4012–4016. (IF: 2.415)

Review Articles

- 1) Ginsberg, S. D.; Neubert, T. A.; Sharma, S.; **Digwal, C. S.**; Yan, P.; Timbus, C.; Wang, T.; Chiosis, G. Disease specific interactome alterations via epichaperomics: the case for Alzheimer's disease. *FEBS J.* 2021, <https://doi.org/10.1111/febs.16031>. (IF: 5.54)

- 2) Nerella, S. G., Singh, P., Sanam, T., **Digwal, C. S.** (2022). PET Molecular Imaging in Drug Development: The Imaging and Chemistry Perspective. *Front. Med.* 2022, 9, 812270. <https://doi.org/10.3389/fmed.2022.812270>. (IF: 5.091)

Book Chapters

- 1) **Digwal, C. S.**; Sharma, S.; Santhaseela, A. R.; Ginsberg, S. D.; Chiosis, G. Epichaperomes as a gateway to understanding, diagnosing, and treating disease through rebalancing protein–protein interaction networks. *Protein Homeostasis in Drug Discovery: A Chemical Biology Perspective*. (Accepted manuscript)
- 2) Taldone, T.; Wang, T.; Rodina, A.; Pillarsetty, N.V.K.; **Digwal, C. S.**; Sharma, S.; Yan, P.; Joshi, S.; Pagare, P.P.; Bolaendar, A.; Roboz, G.J.; Guzman, M.L.; Chiosis, G. A Chemical Biology Approach to the Chaperome in Cancer—HSP90 and Beyond. *Cold Spring Harb. Perspect. Biol.* 2020, 12, a034116. <https://doi.org/10.1101/cshperspect.a034116>. (IF: 9.59)
- 3) Merugu, S.; Sharma, S.; Kaner, J.; **Digwal, C. S.**; Sugita, M.; Joshi, S.; Taldone, T.; Guzman, M.L.; Chiosis, G. Chemical probes and methods for single-cell detection and quantification of epichaperomes in hematologic malignancies. *Methods Enzymol.* 2020, 639, 289-311. (IF: 1.6)

Posters

- Digwal CS, Sharma S, Shrestha L, Xu C, Wang T, Panchal P, Almodovar J.R, Joshi J, Rodina A, Yan P, Taldone T, Chiosis G. 2022 Pharmacology Graduate Program Interview Virtual Schedule. January 24th, 2022.
- Digwal CS, Sharma S, Santhaseela AR, Bay S, Alam A, Joshi S, Rodina A, Yan P, Panchal P, Alldred MJ, Arancio O, Ginsberg SD, Chiosis G. Pharmacology Retreat. 3rd & 4th June, 2022, Bushkill Inn., PA, USA.
- Digwal CS, Sharma S, Joshi S, Inda MC, Wang T, Bolaender A, Gandu S, Panchal P, Martin AR, Merugu S, Rodina A, Yan P, Luo W, Ginsberg SD, Chiosis G. 2021 TPCB Recruiting & Interview Open House. 19th January 2021.
- Digwal CS, Sharma S, Shrestha L, Xu C, Wang T, Panchal P, Almodovar JR, Joshi J, Rodina A, Yan P, Taldone T, Chiosis G. 2019 Postdoctoral Research Symposium. 19th September 2019, MSKCC, NY.
- Digwal CS, Sharma S, Shrestha L, Xu C, Wang T, Panchal P, Almodovar JR, Joshi J, Rodina A, Yan P, Taldone T, Chiosis G. Pharmacology Retreat. 10th-11th May 2019, Crystal Springs Resort, NJ, USA.
- Digwal CS, Sharma S, Shrestha L, Xu C, Wang T, Panchal P, Almodovar JR, Joshi J, Rodina A, Yan P, Taldone T, Chiosis G. Center for Hematologic Malignancies. 4th-5th April 2019, Mohonk Mountain House, New Paltz, USA.
- Digwal CS, Sucharitha L, Koneru M, Yadav U, More K, Atcha KR. 5th International Symposium on CTDDR -2013: Drug Development for Orphan/Neglected Diseases. CSIR–Central Drug Research Institute (CDRI), 26th –28th February 2013, Lucknow, Uttarpradesh, INDIA.
- Koneru M, Yadav U, Digwal CS, Kumar S, Muthuppalaniappan M, Atcha KR. 5th International Symposium on CTDDR -2013: Drug Development for Orphan/Neglected Diseases. CSIR–CDRI, 26th –28th February 2013, Lucknow, Uttarpradesh, INDIA.
- Aaghaz S, Digwal CS, Yadav U, Ariffudin M, Kamal A. International Conference on Biochemistry, Nutrition & Pharmacy in Human Welfare: Recent trends and Future Challenges. Osmania University, 3rd – 5th September, 2015, Hyderabad, INDIA. (1st Best Poster Award)
- Ramya PVS, Digwal CS, Yadav U, Lalitha G, Babu BN, Naidu VGM, Kamal A. National Conference on Drug Discovery & Development (Focus on Cancer & Diabetes). NIPER–Hyderabad, 16th & 17th March, 2017, Hyderabad, INDIA.

Other activities

- Reviewer for Medicinal Chemistry Research, Frontiers in Medicine Nuclear Medicine, NeuroSci, Antibiotics, International Journal of Molecular Sciences, Disease Marker, and ACS Omega.
- Guest Associate Editor for Nuclear Medicine (Frontiers in Medicine)
- Membership: New York Academy of Sciences (2018-2019)