

**DIVYA AWASTHI**  
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## EDUCATION

**Pharmacology & Physiology, Rutgers University-New Jersey Medical School, Newark, NJ**  
Postdoctoral Fellow, Advisor: Professor Joel S. Freundlich (October 2014 - present)

**State University of NY at Stony Brook, Stony Brook, NY**  
Ph.D. (Medicinal Chemistry), Advisor: Professor Iwao Ojima (August 2008 - 2014)

**St. Stephen's College, Delhi University, Delhi, India**  
Masters of Science, Organic Chemistry, 2008  
Bachelor of Science, Chemistry, 2006

## RESEARCH INTEREST

- Medicinal drug discovery focused on infectious/neglected disease research
- Design and synthesis of drug-like molecules
- Development of SAR on potent drug pharmacophores
- Target validation studies via protein expression, purification and enzymatic assays

## RESEARCH EXPERIENCE

**Pharmacology & Physiology, Rutgers University–New Jersey Medical School, Newark, NJ**  
Postdoctoral Fellow - Advisor: Professor Joel Freundlich (October 2014 - present)

- Design, synthesis and biological evaluation of thiophene-based compounds against *M. tuberculosis*
- Probing the fate of small molecule inhibitors in *M. tuberculosis* using metabolomic experiments as a tool
- Identifying inhibitors against fructose bis-phosphatase enzyme from *M. tuberculosis*
- Validating carboxypeptidase as the primary target for a new generation of carbapenem beta-lactams

**Stony Brook University, Department of Chemistry, Stony Brook, NY**

Graduate Student - Advisor: Professor Iwao Ojima, 2008 - 2014

- Designed and synthesized novel trisubstituted benzimidazoles as antibacterial agents targeting FtsZ
- Optimized lead compounds in order to identify potent molecules active against *M. tuberculosis*
- Performed extensive SAR studies on the benzimidazole scaffold to identify highly efficacious antitubercular agents with promising *in vivo* activities
- Synthesized trisubstituted benzimidazoles active against *F. tularensis*, *Y. pestis* and *B. thailandensis*
- Validated the drug target of potent benzimidazoles as FtsZ (cell division protein) via enzymatic assay
- Designed and synthesized photo-affinity labelled analogs (PAL) of lead benzimidazoles for target validation studies
- Re-synthesized lead taxanes active against *M. tuberculosis* and performed target validation studies
- Designed and synthesized trisubstituted benzoxazole mimics of lead benzimidazoles

**Central Drug Research Institute, Lucknow, India**

Summer Fellowship - Advisor: Dr. Madhu Dixit, 2007

- Evaluated the effect of CDRI test compounds on platelet adhesion.

## TEACHING AND MENTORING EXPERIENCE

### Stony Brook University, Department of Chemistry

Teaching assistant, Organic Chemistry (Fall 2008 - Fall 2009)

- Taught undergraduate level organic chemistry to a class of 40 students. Prepared and presented each class lecture

Teaching assistant, Organic Chemistry Lab (Winter session 2008)

Mentored 3 undergraduate students and 2 high school student at State University of NY at Stony Brook

### Rutgers University, Department of Pharmacology and Physiology

Mentored 2 Ph.D. candidates and 1 high school student at Rutgers University

## SKILLS AND TECHNIQUES

- Multistep synthesis: small and large scale synthesis; development and optimization of new synthetic protocols; purification by recrystallization, distillation, column chromatography; polymer assisted solid phase library synthesis
- Analytical Techniques: mass spectroscopy (FIA, HRMS, LC-MS), NMR spectroscopy, HPLC (reverse and normal phase) analysis and method development
- Biological Techniques: plasmid amplification, cell transformation, protein expression, purification (Ni<sup>2+</sup>-NTA affinity chromatography), MIC determination against *M. smeg* via Alamar Blue Assay, MTT cell viability assay against Vero cells
- Target validation studies employing Fluorimeter for Light scattering assay, Transmission Electron Microscopy

## PUBLICATIONS

1. Sukheja, P.; Kumar, P.; Mittal, N.; Li, S.; Singleton, E.; Russo, R.; Perryman, A. L.; Shrestha, R.; **Awasthi, D.**; Husain, S.; Soteropoulos, P.; Brukh, R.; Connell, N.; Freundlich, J. S.; Alland, D., A Novel Small-Molecule Inhibitor of the Mycobacterium tuberculosis Demethylmenaquinone Methyltransferase MenG Is Bactericidal to Both Growing and Nutritionally Deprived Persister Cells. *mBio*, 2017, Ahead of print
2. Ojima, I.; **Awasthi, D.**; Wei, L.; Haranahalli, K., Strategic incorporation of fluorine in the drug discovery of new-generation antitubercular agents targeting bacterial cell division protein FtsZ. *J. Fluorine Chem.* **2016**, Ahead of Print.
3. Knudson, S. E.; **Awasthi, D.**; Kumar, K.; Carreau, A.; Goullieux, L.; Lagrange, S.; Vermet, H.; Ojima, I.; Slayden, R. A., Cell division inhibitors with efficacy equivalent to isoniazid in the acute murine Mycobacterium tuberculosis infection model. *J. Antimicrob Chemother.* **2015**.
4. Park, B.; **Awasthi, D.**; Chowdhury S.R.; Kumar, K.; Melief, E.; Knudson, S.; Slayden, R. A.; Ojima, I., Design, synthesis and evaluation of novel 2,5,6-trisubstituted benzimidazoles targeting FtsZ as antitubercular agents. *Bioorg. Med. Chem.* **2014**, 22 (9), 2602-2612.
5. Singh D.; Bhattacharya A.; Rai A.; Dhaked H.P.S.; **Awasthi D.**; Ojima, I.; Panda D., SB-RA-2001 inhibits bacterial proliferation by targeting FtsZ assembly. *Biochem.* **2014**, 53 (18), 2979–2992.
6. Knudson, S. E.; Kumar, K.; **Awasthi, D.**; Ojima, I.; Slayden, R. A., Potency of benzimidazoles and in vitro activity–efficacy relationship against Mycobacteria tuberculosis. *Tuberculosis.* **2014**, 94 (3), 271-276.
7. Knudson, S. E.; **Awasthi, D.**; Kumar, K.; Carreau, A.; Goullieux, L.; Lagrange, S.; Ojima, I.; Slayden, R. A., A Trisubstituted benzimidazole cell division inhibitor with efficacy against Mycobacteria tuberculosis. *PLoS ONE.* **2014**, 9 (4), e93953.
8. Ojima, I.; Kumar, K.; **Awasthi, D.**; Vineberg, J.G., Microtubules and FtsZ – Drug discovery targeting cell division. *Bioorg. Med. Chem.* **2014**, 22 (18), 5060-5077.
9. **Awasthi, D.**; Kumar, K.; Knudson, S. E.; Slayden, R. A.; Ojima, I., SAR Studies on Trisubstituted Benzimidazoles as Inhibitors of Mtb FtsZ for the Development of Novel Antitubercular Agents. *J. Med. Chem.* **2013**, 56 (23), 9756-9770.
10. Kumar, K.; **Awasthi, D.**; Lee, S.-Y.; Cummings, J. E.; Knudson, S. E.; Slayden, R. A.; Ojima, I., Benzimidazole-based antibacterial agents against *Francisella tularensis*. *Bioorg. Med. Chem.* **2013**, 21 (11), 3318-3326.

11. **Awasthi, D.**; Kumar, K.; Ojima, I., Therapeutic potential of FtsZ inhibition: a patent perspective. *Expert Opin. Ther. Pat.* **2011**, 21 (5), 657-679.
12. Kumar, K.; **Awasthi, D.**; Lee, S.-Y.; Zanardi, I.; Ruzsicska, B.; Knudson, S.; Tonge, P. J.; Slayden, R. A.; Ojima, I., Novel Trisubstituted Benzimidazoles, Targeting Mtb FtsZ, as a New Class of Antitubercular Agents. *J. Med. Chem.* **2011**, 54 (1), 374-381.
13. Kumar, K.; **Awasthi, D.**; Berger, W. T.; Tonge, P. J.; Slayden, R. A.; Ojima, I., Discovery of anti-TB agents that target the cell-division protein FtsZ. *Future Med. Chem.* **2010**, 2 (8), 1305-1323.

## PATENT APPLICATION

- Ojima, I., **Awasthi D.**; Benzimidazoles and uses thereof. **US 61/907,610** (filing date Nov. 22, 2013) or **WO 2015/077276 A1**

## CONFERENCE PRESENTATIONS

- **Awasthi, D.**; Szymonifka, M. J.; Kumar, P.; Rhee, K. Y.; Alland, D.; Freundlich, J. S., Structure-activity relationship of a thiophene family of *M. tuberculosis* Pks13 inhibitors. Abstracts of Papers, 250th ACS National Meeting & Exposition, Boston, MA, August 16-20, (2015), MEDI-424.
- **Awasthi, D.**; Kumar, K.; Knudson, S. E.; Carreau, A.; Goullieux, L.; Lagrange, S.; Slayden, R. A.; Ojima, I.; Design and Synthesis of Trisubstituted Benzimidazoles as Novel Antitubercular Agents. GCS Research Talk, Stony Brook University, 2013.
- Haranahalli, K.; Kumar, K.; **Awasthi, D.**; Knudson, S.; Slayden, R. A.; Ojima, I., Lead optimization of novel benzimidazoles for efficacious antitubercular agents targeting FtsZ. Abstracts of Papers, 246th ACS National Meeting & Exposition, Indianapolis, IN, September 8-12, 2013 (2013), MEDI-60.
- **Awasthi, D.**; Kumar, K.; Melief, E.; Park, B.; Knudson, S.; Slayden, R. A.; Ojima, I., Synthesis and biological evaluation of novel antitubercular trisubstituted benzimidazoles targeting FtsZ. Abstracts of Papers, 245th ACS National Meeting & Exposition, New Orleans, LA, April 7-11, (2013) , MEDI-393.
- Park, B.; Kumar, K.; **Awasthi, D.**; Melief, E.; Knudson, S.; Slayden, R. A.; Ojima, I., Design, synthesis, and evaluation of novel trisubstituted benzimidazoles targeting FtsZ as antimicrobial agents. Abstracts of Papers, 245th ACS National Meeting & Exposition, New Orleans, LA, April 7-11, (2013), pp MEDI-392.
- Kumar, K.; **Awasthi, D.**; Park, B.; Melief, E.; Knudson, S.; Cummings, J.; Slayden, R. A.; Ojima, I., Design, synthesis, optimization, and biological evaluation of novel trisubstituted-benzimidazoles as efficacious antitubercular and antimicrobial agents, targeting FtsZ. Abstracts of Papers, 244th ACS National Meeting & Exposition, Philadelphia, PA, August 19-23, 2012 (2012), MEDI-354.
- **Awasthi, D.**; Kumar, K.; Melief, E. H.; Knudson, S.; Slayden, R. A.; Ojima, I., Synthesis and Biological Evaluation of Novel Antitubercular Trisubstituted Benzimidazoles and Trisubstituted Benzoxazoles Targeting FtsZ. Chemistry Research Day, Stony Brook University, 2012.
- **Awasthi, D.**; Kumar, K.; Melief, E. H.; Knudson, S.; Slayden, R. A.; Ojima, I., Synthesis and Biological Evaluation of Novel Antitubercular Trisubstituted Benzimidazoles and Trisubstituted Benzoxazoles Targeting FtsZ. ICB&DD symposium, Stony Brook University, 2012.
- **Awasthi, D.**; Park, B.; Kumar, K.; Melief, E. H.; Knudson, S.; Slayden, R. A.; Ojima, I., Synthesis and biological evaluation of novel antitubercular trisubstituted benzimidazoles and C-seco taxoids targeting FtsZ. Abstracts of Papers, 243rd ACS National Meeting & Exposition, San Diego, CA, March 25-29, (2012), MEDI-388.
- Park, B.; Kumar, K.; **Awasthi, D.**; Melief, E.; Cummings, J.; Slayden, R. A.; Ojima, I., Synthesis and evaluation of novel trisubstituted benzimidazoles targeting FtsZ as antimicrobial agent. Abstracts of Papers, 243rd ACS National Meeting & Exposition, San Diego, CA, March 25-29, 2012 (2012), MEDI-387.
- **Awasthi, D.**; Kumar, K.; Park, B.; Melief, E.; Knudson, S.; Cummings, J.; Slayden, R. A.; Ojima, I., Synthesis and Biological Evaluation of Novel Antitubercular Trisubstituted Benzimidazoles and C-seco Taxoids Targeting FtsZ II. Diversification of Pharmacophore: Trisubstituted Benzoxazoles. Chemistry Research Day, Stony Brook University, 2011

- **Awasthi, D.**; Kumar, K.; Park, B.; Melief, E.; Knudson, S.; Cummings, J.; Slayden, R. A.; Ojima, I., Synthesis and Biological Evaluation of Novel Antitubercular Trisubstituted Benzimidazoles and C-seco Taxoids Targeting FtsZ II. Diversification of Pharmacophore: Trisubstituted Benzoxazoles. ICB&DD symposium, Stony Brook University, 2011
- **Awasthi, D.**; Kumar, K.; Ruzsicska, B.; Tonge, P. J.; Slayden, R. A.; Ojima, I., Biological evaluation of novel antitubercular trisubstituted benzimidazoles on *Mtb*-FtsZ: Discovery of novel mechanism of action. Abstracts of Papers, 240th ACS National Meeting, Boston, MA, August 22-26, (2010), MEDI-377.
- **Awasthi, D.**; Kumar, K.; Ruzsicska, B.; Tonge, P. J.; Slayden, R. A.; Ojima, I., Biological Evaluation of Novel Antitubercular Trisubstituted Benzimidazoles on *Mtb*-FtsZ: Discovery of Novel Mechanism of Action. ICB&DD symposium, Stony Brook University, 2010
- **Awasthi, D.**; Kumar, K.; Ruzsicska, B.; Tonge, P. J.; Slayden, R. A.; Ojima, I., Biological Evaluation of Novel Antitubercular Trisubstituted Benzimidazoles on *Mtb*-FtsZ: Discovery of Novel Mechanism of Action. Chemistry Research Day, Stony Brook University, 2010
- Kumar, K.; **Awasthi, D.**; Ruzsicska, B.; Tonge, P. J.; Slayden, R. A.; Ojima, I. Synthesis, SAR and biological evaluation of novel benzimidazoles targeting FtsZ for drug discovery of efficacious. Abstracts of Papers, 240th ACS National Meeting, Boston, MA, August 22-26, 2010 (2010), MEDI-511.