

Sherif I. Elshahawi, B.Pharm, M.Sc, Ph.D

Assistant Professor of Natural Products and Alternative Medicine
Department of Biomedical and Pharmaceutical Sciences
Chapman University School of Pharmacy (CUSP)
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EDUCATION AND TRAINING

- **University of Kentucky, Lexington, Kentucky** 2012 – 2017
Post-doctoral Scholar, Division of Drug Discovery, Department of Pharmaceutical Sciences, College of Pharmacy
Postdoctoral Scholar, Center for Pharmaceutical Research and Innovation (CPRI), Natural Products Core and Repository, Natural Products Discovery program
Professor Jon Thorson
- **Oregon Health & Science University (OHSU), Portland, Oregon** 2006 – 2012
Ph.D., Biochemistry and Molecular Biology, School of Medicine
Professor Margo G. Haygood (Committee Chair)
Thesis: “Isolation and Biosynthesis of Bioactive Natural Products Produced by Marine Symbionts”
- **University of Mississippi, Oxford, Mississippi** 2004 – 2006
M.Sc., Pharmacognosy, School of Pharmacy
Professor Marc Slattery
Thesis: “Comparison of the HPLC/PDA Chemical Fingerprint of the Hybrid Soft Coral *Sinularia maxima* × *Sinularia polydactyla* and its Parents”
- **Cairo University, Egypt** 1995 – 2000
B.Sc., Faculty of Pharmacy, Very Good/ Honors

TEACHING EXPERIENCE

Assistant Professor at the Department of Biomedical and Pharmaceutical Sciences, Chapman University School of pharmacy 2017 – Present

- PHRM 549 (Pulmonology and COPD, PharmD students, team-based learning)
- PHS 612/735 (Advanced Principles of Drug Action, graduate students, team-based learning)
- PHRM 555 (Infectious Diseases II, PharmD students, team-based learning)
- PHRM 642 (Biopharmaceuticals, PharmD students, team-based learning)

Senior Teaching Assistant at the Department of Pharmacognosy, Faculty of Pharmacy, Misr International University (MIU), Egypt 2000 – 2004

- Taught and demonstrated all the laboratory sections of the Pharmacognosy, Phytochemistry & Herbal Medicine courses for Freshman, Sophomore, Middle, Junior and Senior Pharmacy students.

- Trained and evaluated other teaching assistants in the department and coordinated between them and the Professors.
- Contributed to the course design and development.

RESEARCH INTERESTS

1. Drug discovery and development for cancer, infectious and inflammation diseases
2. Natural product discovery and diversification
3. Identification and characterization of biologically active natural product gene clusters and biosynthetic enzymes
4. Characterization and engineering of biocatalysts for drug diversification

AWARDS AND FUNDING

1. Ongoing
 - a. Departmental Start-Up Grant, Chapman University School of Pharmacy (PI) 07/17/17 – 05/31/22, Research Start-Up Funds.
The purpose of this grant is to set up the PI's laboratory and fund preliminary studies needed to be competitive for extramural research support.
Role: PI
 - b. Internal Fund, Chapman University (\$5,000) 06/15/2021 – 06/14/2022, Creating Engineered Proteins to Synthesize Next-Generation Antibiotics Targeting Resistant Bacteria.
Role: PI
2. Expired
 - a. Faculty Opportunity Fund Award, Chapman University (\$15,000) 06/01/2019 – 05/31/2021, Exploring California National Parks as a Source for Drug-Lead Discovery
The purpose of this grant is to cultivate soil bacteria from national parks and use them as sources for biologically-active natural products.
Role: PI
 - b. American Association of Colleges of Pharmacy New Investigator Award (\$10,000), 02/01/19 – 01/31/20, Generation of Lipopeptide Analogs Using Biocatalytic Methods.
The purpose of this grant is to generate more potent daptomycin derivatives using natural products enzymatic and chemical methods
Role: PI

HONORS

Teacher of the Year Award 2019, American Association of Colleges of Pharmacy

PUBLICATIONS (in chronological order) [Pubmed]

1. Mupparapu N, Lin Y-HC, Kim TH, **Elshahawi SI**. Regiospecific synthesis of calcium-independent daptomycin antibiotics using a chemoenzymatic method. *Chemistry – A*

- European Journal*. 2021 Feb 24;27(12):4176-4182. PMID: 33244806, doi: 10.1002/chem.202005100. [[Pubmed](#)]
2. Wang X, **Elshahawi SI**, Ponomareva LV, Ye Q, Liu Y, Copley GC, Hower JC, Hatcher BE, Kharel MK, Van Lanen SG, She Q-B, Voss SR, Thorson JS, Shaaban KA. Structure determination, functional characterization and biosynthetic implications of nybomycin metabolites from a mining reclamation site-associated *Streptomyces*. *J Nat Prod*. 2019 82(12):3469-3476. [[Pubmed](#)]
 3. Wang X, Abbas M, Zhang Y, **Elshahawi SI**, Ponomareva LV, Cui Z, Van Lanen SG, Sajid I, Voss SR, Shaaban KA, Thorson JS. Baraphenazines A-G, divergent fused phenazine-based metabolites from a Himalayan *Streptomyces*. *J Nat Prod*. 2019, 82(6):1686-1693. [[Pubmed](#)]
 4. Abbas M, **Elshahawi SI**, Wang X, Ponomareva LV, Sajid I, Shaaban KA, Thorson JS. Puromycins B–E, naturally occurring amino-nucleosides produced by the Himalayan isolate *Streptomyces* sp. PU-14G. *J. Nat. Prod.*, 2018, 81(11): 2560–2566. [[Pubmed](#)]
 5. Wang X, **Elshahawi SI**, Cai W, Zhang Y, Ponomareva LV, Chen X, Copley GC, Hower JC, Zhan CG, Parkin S, Rohr J, Van Lanen SG, Shaaban KA, Thorson JS. Bi- and tetracyclic spirotetronates from the coal mine fire isolate *Streptomyces* sp. LC-6-2. *J Nat Prod*. 2017, 80(4):1141-1149. [[Pubmed](#)]
 6. **Elshahawi SI**, Cao C, Shaaban KA, Ponomareva LV, Subramanian T, Farman ML, Spielmann HP, Phillips GN Jr., Thorson JS, Singh S. Underground coal mine fire-associated microbes as a source for biocatalyst discovery. *Nat. Chem Biol*. 2017, 13(4):366-368. [[Pubmed](#)]
 7. Wang X, Zhang Y, Ponomareva LV, Qiu Q, Woodcock R, **Elshahawi SI**, Chen X, Zhou Z, Hatcher BE, Hower JC, Zhan CG, Parkin S, Kharel MK, Voss SR, Shaaban KA, Thorson JS. Mccreamycins A-D, geldanamycin-derived cyclopentenone macrolactams from an Eastern Kentucky abandoned coal mine microbe. *Angew Chem Int Ed Engl*. 2017, 56(11):2994-2998. [[Pubmed](#)]
 8. Zhang J, Hughes RR, Saunders MA, **Elshahawi SI**, Ponomareva LV, Zhang Y, Winchester SR, Scott SA, Sunkara M, Morris AJ, Prendergast MA, Shaaban KA, Thorson JS. Identification of neuroprotective spoxazomicin and oxachelin glycosides via chemoenzymatic glycosyl-scanning. *J Nat Prod*. 2017, 80(1):12-18. [[Pubmed](#)]
 9. Shaaban KA, Saunders MA, Zhang Y, Tran T, **Elshahawi SI**, Ponomareva LV, Wang X, Zhang J, Copley GC, Sunkara M, Kharel MK, Morris AJ, Hower JC, Tremblay MS, Prendergast MA, Thorson JS. Spoxazomicin D and oxachelin C, potent neuroprotective carboxamides from the Appalachian coal fire-associated isolate *Streptomyces* sp. RM-14-6. *J Nat Prod*. 2017, 80(1):2-11. [[Pubmed](#)]
 10. Wenlong C, Wang X, **Elshahawi SI**, Ponomareva LV, Liu X, McErlean M, Cui Z, Arlinghaus A, Thorson JS, Van Lanen SG. Antibacterial and cytotoxic actinomycins Y6-Y9 from *Streptomyces* sp. strain Gö-GS12. *J Nat Prod*. 2016, 79(10):2731-2739. [[Pubmed](#)]
 11. Shaaban KA, **Elshahawi SI**, Wang X, Horn J, Kharel MK, Leggas M, Thorson JS. Cytotoxic indolocarbazoles from *Actinomadura melliaura* ATCC 39691. *J Nat Prod*. 2015, 78(7):1723-1729. [[Pubmed](#)]
 12. Wang X, Reynolds AR, **Elshahawi SI**, Shaaban KA, Ponomareva LV, Saunders MA, Elgumati IS, Zhang Y, Copley GC, Hower JC, Sunkara M, Morris AJ, Kharel MK, Van Lanen SG, Prendergast MA, Thorson JS. Terfestatins B and C, new p-terphenyl glycosides produced by *Streptomyces* sp. RM-5-8. *Org Lett*. 2015, 17(11):2796-2799. [[Pubmed](#)]

13. **Elshahawi SI***, Shaaban KA*, Kharel MK, Thorson JS. A comprehensive review of glycosylated bacterial natural products. *Chemical Society Reviews*. 2015, 44(21):7591-7697. [[Pubmed](#)]
14. **Elshahawi SI**, Ramelot TA, Seetharaman J, Chen J, Singh S, Yang Y, Pederson K, Kharel MK, Xiao R, Lew S, Yennamalli RM, Miller MD, Wang F, Tong L, Montelione GT, Kennedy MA, Bingman CA, Zhu H, Phillips GN Jr, Thorson JS. Structure-guided functional characterization of enediynes self-sacrifice resistance proteins, CalU16 and CalU19. *ACS Chem Biol*. 2014, 9(10):2347-2358. [[Pubmed](#)]
15. Wang X, Shaaban KA, **Elshahawi SI**, Ponomareva LV, Sunkara M, Copley GC, Hower JC, Morris AJ, Kharel MK, Thorson JS. Mullinamides A and B, new cyclopeptides produced by the Ruth Mullins coal mine fire isolate *Streptomyces* sp. RM-27-46. *J. Antibiot*. 2014, 67(8):571-575. [[Pubmed](#)]
16. Wang X, **Elshahawi SI**, Shaaban KA, Fang L, Ponomareva LV, Zhang Y, Copley GC, Hower JC, Zhan C-G, Kharel MK, Thorson JS. Ruthmycin, a new tetracyclic polyketide from *Streptomyces* sp. RM-4-15. *Org. Lett*. 2014, 16(2):456-459. [[Pubmed](#)]
17. Shaaban KA, Singh S, **Elshahawi SI**, Wang X, Ponomareva LV, Sunkara M, Copley GC, Hower JC, Morris AJ, Kharel MK, Thorson JS. The native production of the sesquiterpene isopterocarpolone by *Streptomyces* sp. RM-14-6. *Nat Prod Res*. 2014, 28(5):337-339. [[Pubmed](#)]
18. Shaaban KA, Singh S, **Elshahawi SI**, Wang X, Ponomareva LV, Sunkara M, Copley GC, Hower JC, Morris AJ, Kharel MK, Thorson JS. Venturicin C, a new 20-membered macrolide produced by *Streptomyces* sp. TS-2-2. *J. Antibiot*. 2013, 67(3):223-230. [[Pubmed](#)]
19. Shaaban KA, Wang X, **Elshahawi SI**, Ponomareva LV, Sunkara M, Copley GC, Hower JC, Morris AJ, Kharel MK, Thorson JS. Herbimycins D-F, ansamycin analogues from *Streptomyces* sp. RM-7-15. *J Nat Prod*. 2013, 76(9):1619-1626. [[Pubmed](#)]
20. Wang X, Shaaban KA, **Elshahawi SI**, Ponomareva LV, Sunkara M, Zhang Y, Copley GC, Hower JC, Morris AJ, Kharel MK, Thorson JS. Frenolicins C-G, pyranonaphthoquinones from *Streptomyces* sp. RM-4-15. *J Nat Prod*. 2013, 76(8):1441-1447. [[Pubmed](#)]
21. **Elshahawi SI**, Trindade-Silva AE, Hanora A, Han AW, Flores MS, Vizzoni V, Schrago CG, Soares CA, Concepcion GP, Distel DL, Schmidt EW, Haygood MG. Boronated tartrolon antibiotic produced by symbiotic cellulose-degrading bacteria in shipworm gills. *Proc. Natl. Acad. Sci (PNAS)*. 2013, 110(4):E295-304. [[Pubmed](#)]
22. Donia M, Fricke WF, Partensky F, Cox J, **Elshahawi SI**, White J, Phillippy A, Schatz M, Piel J, Haygood M, Ravel J, Schmidt EW. Complex microbiome underlying secondary and primary metabolism in the tunicate-*Prochloron* symbiosis. *Proc. Natl. Acad. Sci (PNAS)*. 2011, 108(51):E1423-E1432. [[Pubmed](#)]
23. Yang JC, Madupu R, Durkin AS, Ekborg NA, Pedamallu CS, Hostetler JB, Radune D, Toms BS, Henrissat B, Coutinho PM, Schwarz S, Field L, Trindade-Silva AE, Soares CA, **Elshahawi S**, Hanora A, Schmidt EW, Haygood MG, Posfai J, Benner J, Madinger C, Nove J, Anton B, Chaudhary K, Foster J, Holman A, Kumar S, Lessard PA, Luyten YA, Slatko B, Wood N, Wu B, Teplitski M, Mougous JD, Ward N, Eisen JA, Badger JH, Distel DL. The complete genome of *Teredinibacter turnerae* T7901: an intracellular endosymbiont of marine wood-boring bivalves (shipworms). *PLoS One*. 2009, 4(7):E6085. [[Pubmed](#)]

CONFERENCE PRESENTATIONS (Only those I presented myself are stated)

- Munjy L, **Elshahawi SI**, Ostrom RS. Integrating the Basic and Clinical Sciences in the PharmD Curriculum to Increase Critical Thinking Skill Sets. MEHP Decennial Virtual Conference, John Hopkins University School of Education. July 2021
- Mupparapu N, Lin Y-H C, Kim TH, **Elshahawi SI**. “Enzymatic Synthesis of Calcium-Independent Superior Daptomycin Analogs”. ACS National Spring Meeting. April 2021
- **Elshahawi SI**. "Enzymatic Synthesis of Daptomycin Analogs to Combat Resistant Bacteria." American Association of Colleges of Pharmacy, Chemistry Section. Invited speaker. Feb 2021
- Mupparapu N, Lin YH, Kim TH, Brewster L, **Elshahawi SI**. Specific Modifications of Tryptophan-Containing Peptides Using a Chemoenzymatic Platform. Applied Biocatalysis Summit 2020. November 2020
- **Elshahawi SI**. American Association of Colleges of Pharmacy (AACP) Virtual Meeting. “Generation of Lipopeptide Analogs Using Biocatalytic Methods”. July 2020
- **Elshahawi SI**, Mupparapu N, Lin Y-HC. Generation of Lipopeptide Analogs Using Biocatalytic Methods. Part of the "New Investigator Award Recipient Poster Abstracts Presented at the 121st Virtual Annual Meeting of the American Association of Colleges of Pharmacy, July 13-31, 2020". American Journal of Pharmaceutical Education June 2020, 84 (6) ajpe8231
- **Elshahawi SI**. American Association of Colleges of Pharmacy (AACP) Chemistry Section Business Virtual Meeting. “Generation of Lipopeptide Analogs Using Biocatalytic Methods”. June 2020
- **Elshahawi SI**. Society for Industrial Microbiology and Biotechnology; 3rd International Conference on Natural Product Discovery and Development in the Genomic Era. San Diego, CA. “Specific Modification of Peptides Using Biocatalytic Tools” Jan 2020
- **Elshahawi SI**. Society for Industrial Microbiology and Biotechnology Annual Meeting. Chicago, IL. “Selective Prenyltransferase Enzymes for the Development of Biologically-Active Molecules” August 2018

AD HOC REVIEWER

- Chembiochem
- Scientific Reports
- Antibiotics
- Journal of Industrial Microbiology and Biotechnology
- Marine Drugs
- Research in Microbiology
- RSC Advances
- Naunyn-Schmiedeberg's Archives of Pharmacology
- Molecules
- PLOS One
- Journal of Fungi

OTHER ACTIVITIES

- Served as a guest academic editor for “BioMed Research International”

SCIENTIFIC SOCIETIES

- American Society of Pharmacognosy (ASP)

- Society for Industrial Microbiology and Biotechnology (SIMB)
- American Chemical Society (ACS)
- American Association of Colleges of Pharmacy (AACP)

MEDIA COVERAGE

- Symbiotic bacteria administer novel antibiotics
<http://www.nature.com/nmiddleeast/2013/130114/full/nmiddleeast.2013.5.html>
- Could the next new cancer drug come from Kentucky coal mines?
<http://medicalxpress.com/news/2013-11-cancer-drug-kentucky-coal.html>
- American Society of Pharmacognosy student poster award winner
http://www.ohsu.edu/xd/education/schools/school-of-medicine/departments/basic-science-departments/environmental-biomolecular-systems/news/asp_2011_student_poster_winner.cfm
- Microbes Rule the Waves
<http://biol3309-2012.blogspot.com/2013/03/boronated-tartrolon-antibiotic-produced.html>
- A team science publication resulting from the College's Kentucky coal mine research is the college's monthly highlight
<http://pharmacy.mc.uky.edu/display.php?id=1156>
- Bacterium from coal mine fire could aid drug targeting
<http://news.rice.edu/2017/02/06/bacterium-from-coal-mine-fire-could-aid-drug-targeting-2/>
- Mining for new cancer fighters. A microbe found in an abandoned Kentucky coal mine produces novel compounds
<http://cen.acs.org/articles/95/i7/Mining-new-cancer-fighters.html?type=paidArticleContent>
- Pharmaceuticals from a coal mine?
<http://www.sciencedaily.com/releases/2017/02/170206130415.htm>

PERSONNEL MENTORED

Students and Postdoctoral have conducted research under my mentorship. My responsibilities included helping them to design, conduct, and analyze hypothesis-driven research projects. This included ensuring proficiency with common and specific lab techniques and protocols and helping to structure individual research presentations. They made/ are making sufficient contributions to warrant authorship on peer-reviewed research articles and/or poster presentations.

- Diem Nguyen, PhD Student April 2021 – Present
- Emily Gonzalez, PharmD Student, “Secondary metabolite reservoir of terrestrial microorganisms” May 2021 – Present
- Anthony Luis, Undergraduate Student, “Biocatalytic synthesis of an antimicrobial compound” Dec 2020 – Present
- Kunal Patel, PharmD Student, “Virtual screening of natural products against Sars-Cov-2 targets” May 2020 – Present
- Engy Beaway, PharmD Student, “A collection of prenylated natural product compounds” May 2020 – Present
- Nikita Dave, Undergraduate Student, “Protein purification for drug diversification” Dec 2019 – Feb 2020
- Ahmad Alrusayes, Undergraduate Student, “Protein engineering for drug development” Oct 2019 – May 2020

- Brian Kim, Undergraduate Student, “Secondary metabolite reservoir of terrestrial microorganisms”
Sept 2019 – May 2020
- Lauren Brewster, Undergraduate Student, “Protein purification for drug diversification”
Aug 2019 – May 2020
- Katrina Ostrom, Undergraduate Student, “Highthroughput screening of biocatalytic drug conversion”
June 2019 – Aug 2019
- Lamya Al-Saleh, Undergraduate Student, “Protein purification for drug diversification”
May 2019 – Aug 2019
- Tiffany Nguyen, Undergraduate Student, “Protein purification for drug diversification”
May 2019 – Aug 2019
- Zhengfeiyue (Chelsea) Pan, Undergraduate Student “An amino acid switch increases the promiscuity of a carbon-carbon bond forming biocatalyst” that led her to winning Best Poster Award in the Southern California Conferences for Undergraduate Research (SCCUR)”
May 2019 – Jan 2020
- Yu-Hsin (Cindy) Lin, PharmD Student “Secondary metabolite reservoir of terrestrial microorganisms”
Jan. 2019 – Aug 2020
- Nagaraju Mupparapu, Postdoctoral Scholar “Chemoenzymatic synthesis of biologically active compounds”
Aug. 2018 – Present
- Christopher Nguyen, Undergraduate Student “Protein purification for drug diversification”
Aug. 2018 – Feb 2020
- Michelle Le, Undergraduate Student “Large scale protein overproduction for drug diversification”
Aug. 2018 – Dec 2018
- Ahmed Aoun, M.Sc Student “Altering the regiospecificity of C6 indole prenyltransferase enzymes towards drug development”
Nov. 2017 – July 2019
- Tae Ho Kim, PharmD Student “Production and purification of Prenyltransferases”
May 2018 – May 2020