Soraya Alnabulsi, Ph.D.

Associate Professor in Medicinal Chemistry
Department of Medicinal Chemistry and Pharmacognosy
Faculty of Pharmacy
Jordan University of Science and Technology
P.O. Box 3030, Irbid 22110
Jordan
Phone: (+962)2-7201000
Email: smalnabulsi@just.edu.jo

Personal Profile

I am Soraya Alnabulsi from Irbid-Jordan. I am currently working as an assistant professor in Medicinal Chemistry at the Department of Medicinal Chemistry and Pharmacognosy/ Faculty of Pharmacy/ Jordan University of Science and Technology (JUST). Since my joining JUST in 2014, I have taught pharmaceutical organic and medicinal chemistry courses for bachelor students and advanced courses in organic synthesis and drug design for master students. I earned my Ph.D. degree in Pharmacy and Pharmaceutical Sciences with a specialization in Synthetic Medicinal Chemistry from the University of Manchester/ Manchester/ UK in December 2013. Regarding research, I am interested in the design and synthesis of chemotherapeutic drug candidates modulating the activity of validated novel cancer targets; namely SMYD3, LSD1, and pim-1 kinase. Besides, I am interested in preparing covalent drug-chitosan conjugates aiming at the production of drug formulations with a sustained-release profile.

Education

2010-2013
PhD in Pharmacy and Pharmaceutical Sciences, specialization in Medicinal Chemistry

Manchester Pharmacy School, The University of Manchester, Oxford Road, Manchester, M13 9PL, UK

Thesis topic: Synthesis and evaluation of novel NQO2 inhibitors.
Advisors: Dr. Sally Freeman and Prof. Ian Stratford

Research in brief:
The NRH: quinone oxidoreductase 2 enzyme (NQO2) is a potential therapeutic target in cancer, malaria, and neurodegenerative diseases. The inhibition of NQO2 enzyme activity may have a role in cancer chemoprevention and chemotherapy. The objective of the research was the design, synthesis, and evaluation of novel selective NQO2 inhibitors with no off-target effects, for example, binding to DNA. From previous virtual screening studies of the NCI database, symmetrical and non-symmetrical

furan-amidines were identified as lead inhibitors of the NQO2 enzyme, with IC50 values of 630 nM for 4,4'-(furan-2,5-diyl)dibenzamidine, 50 nM for 4,4'-(3,4-dimethylfuran-2,5-diyl)dibenzamidine and 140 nM for 4-(5-phenylfuran-2-yl)benzamidine.

A synthetic pathway for the synthesis of the non-symmetrical furan-amidines was established, which involved the cyclization of the 1,4-diketone intermediates to give the furan ring. Several furan analogues with a range of substituents on the aromatic ring (e.g. fluoro, bromo, nitro, methyl, ethyl, isopropyl, tert-butyl, methoxy) were prepared. Also, isosteres of the amidine group were made, including imidate, N-aryl amidine (reversed amidine), N-aryl amide and N-hydroxyamidine (amidoxime). The furan ring was replaced with other 5-membered heterocycles, including pyrrole, N-methylpyrrole, thiophene, imidazole, N-methylimidazole and oxazole. All compounds were fully characterized by 1H and 13C NMR spectroscopy, IR spectroscopy, and mass spectrometry. The synthesized asymmetric furan-amidines and their analogues showed potent NQO2 inhibition activity with IC50 values in the nano-molar range. The most active compounds were the non-symmetrical furan-amidines with *meta*- and *para*-nitro substitution on the aromatic ring, with IC_{50} values of 15 nM.

The high NQO2 inhibition activity of some analogues together with their high toxicity against several breast cancer cell lines, make these lead compounds worthy of further development and optimization as potential drugs.

2003-2007
Master of Medicinal Chemistry and Pharmacognosy (with an average of 84.8%).

Faculty of Pharmacy, Jordan University of Science and Technology,
P.O.Box 3030, Irbid 22110, Jordan.

Thesis topic: Synthesis and evaluation of ketorolac Prodrugs for Transdermal Delivery.
Advisors: Prof. Amjad Qandil and Dr. Bashar Al-Taa'ni

Research in brief:

Ketorolac, an NSAID, has low intrinsic permeation capacity through the skin. In this work, seven piperazinylalkyl ester prodrugs of ketorolac were synthesized to enhance its skin permeation. The chemical hydrolysis and the stability in human serum at 37°C were investigated in buffer solutions (pH 5.0 and 7.4) and in 80% human serum (pH 7.4), respectively. The prodrugs were chemically more stable at pH 5.0 than at pH 7.4. The prodrugs' $t_{1/2}$ in human serum ranged from 0.79 to 3.92 min. The prodrugs' aqueous solubility was measured in buffer solution at pH 5.0 and 7.4 and Log Papp was measured by partitioning between buffer solution (pH 5.0 and 7.4) and n-octanol. The prodrugs were more lipophilic than ketorolac at pH 7.4. Skin permeation of ketorolac and the most stable chemically prodrug through rat skin was studied at pH 5.0 and 7.4.

1998-2003
Bachelor of Pharmacy (with an average of 90.1%, I was the first among my 1998 pharmacy batch)

Faculty of Pharmacy, Jordan University of Science and Technology, P.O.Box 3030, Irbid 22110, Jordan.

Academic Experiences

2021-present
Associate professor in Medicinal chemistry teaching pharmaceutical organic and medicinal chemistry (I, II and III) courses for undergraduates and advanced courses in drug design and synthesis for postgraduates.

Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmacy, Jordan University of Science and Technology, P.O.Box 3030, Irbid 22110, Jordan.

2014-2021
Assistant professor in Medicinal chemistry teaching pharmaceutical organic and medicinal chemistry (I, II and III) courses for undergraduates and advanced courses in drug design and synthesis for postgraduates.

Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmacy, Jordan University of Science and Technology, P.O.Box 3030, Irbid 22110, Jordan.

2007-2010
Part-time lecturer teaching practical pharmaceutical organic, analytical and medicinal chemistry and instrumental analysis and quality control courses for undergraduate pharmacy students.

Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmacy, Jordan University of Science and Technology, P.O.Box 3030, Irbid 22110, Jordan.

2004-2005
Teaching assistant in practical pharmaceutical organic, analytical and medicinal chemistry and instrumental analysis and quality control courses for undergraduate pharmacy students.

Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmacy, Jordan University of Science and Technology, P.O.Box 3030, Irbid 22110, Jordan.

Postdoctoral Research Experiences

10/6-30/8/2019
Academic visitor

Division of Pharmacy and Optometry, School of Health Sciences, University of Manchester, Manchester, M13 9PL, UK.

Research topic: Synthesis and biological evaluation of [18F]-labelled PD1/PD-L1 pathway inhibitor as PET tracer for tumour imaging.

Research in brief: [^{18}F]-labelled tracer was prepared starting from the structure of a reported potent PD-1/PD-L1 pathway small molecule inhibitor 2-(((2-(2-methyl-[1,1'-biphenyl]-3-yl)benzo[d]oxazol-5-yl)methyl)amino)ethan-1-ol. The ability of the tracer to detect PD-L1 expression in mice xenografts was evaluated ex vivo using positron emission tomography (PET) imaging. Furthermore, tissue distribution and target specificity of the [^{18}F]-labelled PET tracer was studied using ex vivo biodistribution and blocking studies.

Administrative Experiences

05/9/2021-present
Department Head

Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmacy, Jordan University of Science and Technology, P.O.Box 3030, Irbid 22110, Jordan.

05/09/2020-05/09/2021
Assistant Dean

Deanship of Pharmacy, Jordan University of Science and Technology, P.O.Box 3030, Irbid 22110, Jordan.

Other Experiences

1- Responsible Pharmacist, Al-Miramar Pharmacy, Irbid-Jordan, (March 2003-October 2003).
2- Responsible Pharmacist, Al-Razi pharmacy, Irbid- Jordan, (October 2003-Febreuary 2007).

Professional Membership

1- Member of Jordanian Pharmaceutical Association

Publications

1. Tamam El-Elimat, Mario Figueroa, Huzefa A. Raja, **Soraya Alnabulsi**, Nicholas H. Oberlies. Coumarina, dihydrocoumarins, a dibenzo-α-pyrone, a meroterpenoid, and a merodrimane from *Talaromyces amestolkiae*. Tetrahedron Letters, 2021
2. **Soraya Alnabulsi**, Enas A. Al-Hurani. Pim kinase inhibitors in cancer: medicinal chemistry insights into their activity and selectivity. Drug Discovery Today, 2020; 25: 2062-9.
3. **Soraya Alnabulsi**, Nizar A. Al-Shar'I, Enas A. Al-Hurani, Tamam El-Elimat. Amino-carboxamide benzothiazoles as potential LSD1 hit inhibitors. Part I: Computational fragment-based drug design. Journal of Molecular Graphics and Modelling, 2019; 39: 107440
4. **Soraya Alnabulsi**, Nizar A. Al-Shar'i. Hit identification of SMYD3 enzyme inhibitors using structure-based pharmacophore modelling. Future Medicinal Chemistry, 2019; 11 (10): 1107-17.
5. **Soraya Alnabulsi**, Buthaina Hussein, Elham Santina, Izzedin Alsalahat, Manikandan Kadirvel, Rachael N. Magwaza, Richard A. Bryce, Carl H. Schwalbe, Alex G. Baldwin, Illaria Russo, Ian J. Stratford, Sally Freeman. Evaluation of analogues of furan-amidines as inhibitors of NQO2. Bioorganic and Medicinal Chemistry Letters, 2018; 28 (8): 1292-7.
6. Nizar Al-Shar'I, **Soraya Alnabulsi**. Explaining the autoinhibition of the SMYD enzyme family: A theoretical study. Journal of Molecular Graphics and Modelling, 2016; 68: 147-57.
7. **Soraya Alnabulsi**, Elham Santina, Ilaria Russo, Buthaina Hussein, Manikandan Kadirvel, Amy Chadwick, Elena V. Bichenkova, Richard A. Bryce, Karen Nolan, Constantinos Demonacos, Ian J. Stratford, Sally Freeman. Non-symmetrical furan-amidines as novel leads for the treatment of cancer and malaria. European Journal of Medicinal Chemistry, 2016; 111: 33-45.
8. Amjad Qandil, **Soraya Al-Nabulsi**, Bashar Al-Taani, Bassam Tashtoush. Synthesis of piperazinylalkyl ester prodrugs of ketorolac and their *in vitro* evaluation for transdermal delivery. Drug Development and Industrial Pharmacy, 2008; 34: 1054-63
9. A. M. Qandil, B. M. Tashtoush, B. M. Al-Taani, **S. M. Al-Nabulsi**, F. Al-Zogoul. Simultaneous RP-LC determination of ketorolac and its piperazinylalkyl ester prodrugs. Chromatographia, 2008; 67: 287-291.

Workshops and Conferences

1- Royal Society of Chemistry Conference, Manchester, UK, April, **2011**.

2- "Effective Publication: taking the sting out of peer review" workshop, The University of Manchester, UK, February, **2012**.

3- RSC-BMCS (Royal Society of Chemistry- Biological and Medicinal Chemistry Sector) symposium: 2nd symposium on Chemical Biology for Drug Discovery in AstraZenca, Macclesfield, UK, March, 20-21, **2012**.

4- The 9th NCRI (National Cancer Research Institute) Cancer Conference. Liverpool, UK, November 3-6, **2013**.

5- The 5th International Conference on Drug Discovery & Therapy. Dubai, UAE, Feb **2013**. Poster**: Soraya Alnabulsi**, Elham Santina, Amy Chadwick, Elena Bichenkova, Richard Bryce, Karen Nolan, Constantinos Demonacos, Ian Stratford and Sally Freeman. Design and Synthesis of Novel NQO2 inhibitors.

6- "Innovation Teaching in Higher Education" workshop, Academic Development and Quality Assurance Center, Jordan University of Science and Technology, Irbid, May 26-27, **2015**.

7- "The Curriculum Mapping" workshop. Faculty of Pharmacy, Jordan University of Science and Technology, Irbid, March 28, **2017**.

8- The 4th conference for Faculties of Pharmacy in Jordan and JUST International Pharmacy Conference. Faculty of Pharmacy, Jordan University of Science and Technology, Irbid, August 2-4, **2017**.

9- "Problem-based Learning" workshop, Academic Development and Quality Assurance Center, Jordan University of Science and Technology, Irbid, January 10-11, **2018**.

10- "Statistical Data Analysis Using Minitab" workshop, Academic Development and Quality Assurance Center, Jordan University of Science and Technology, Irbid, January 3-4, **2018**.

Grant Reviewing

1- Jordanian Scientific Research Support Fund
2- University of Qatar Collaborative Grants

Grants

1- Deanship of Research/ Jordan University of Science and Technology Grant No. 155/2015. Design and biological evaluation of novel inhibitors of the lysine methyltransferase enzyme SMYD3. 2015-2016, amount: 13500 JD (Principal Investigator).

2- Deanship of Research/ Jordan University of Science and Technology Grant No. 241/2016. Synthesis and biological evaluation of novel inhibitors of the lysine methyltransferase enzyme SMYD3. 2016-2019, amount: 8000 JD (Principal Investigator).

3- Deanship of Research/ Jordan University of Science and Technology Grant No. 119/2019. Structure-based design of SMYD3 enzyme inhibitors as potential anticancer candidates. 2019-present, amount: 9400 JD (Principal Investigator).

4- Deanship of Research/ Jordan University of Science and Technology Total Synthesis and biological evaluation of Greensborone C and its analogues. (Co-Principal Investigator).

5- Deanship of research/ Jordan University of Science and Technology Grant No. 443/2018. Preparation and characterization of mesalamine chitosan conjugates for extended delivery to the colon. 2018-present, amount: 9610 JD (Co-Principal Investigator).

6- Deanship of research/ Jordan University of Science and Technology. Design, Synthesis and Biological Evaluation of Novel SMYD3 Small-Molecule Inhibitors as Anticancer Candidates. (Co-Principal Investigator).

7- Deanship of research/ Jordan University of Science and Technology. Biological Evaluation of Novel SMYD3 Small-Molecule Inhibitors as Anticancer Candidates. (Co-Principal Investigator).

8- Deanship of Research/ Jordan University of Science and Technology Grant No. 18/2020. Optimization of SMYD3 enzyme lead inhibitor BCI-121. 2020-present, amount: 9950 JD (Principal Investigator).

9- Deanship of Research/ Jordan University of Science and Technology Grant No. 656/2020. Optimization of LSD1 hit inhibitor with piperidine carboxamide scaffold as potential anticancer agent. 2020-present, amount: 9998 JD (Principal Investigator).

Graduate students supervision

1- Enas Adnan Al-Hurani:

- MS.c. in Medicinal Chemistry, Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmacy, Jordan University of Science and Technology. January, 2019.
- Thesis title: 'Design, Synthesis and Biological Evaluation of LSD1 Inhibitors as Potential Anticancer Agents Using Fragment-Based Drug Design Approach'.

2- Du'a Mohammad Al-Bustanji:

- MS.c. in Medicinal Chemistry, Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmacy, Jordan University of Science and Technology. August, 2020.
- Thesis title: Hit-to-lead optimization of amino-carboxamide benzothiazoles as LSD1 inhibitors with potential anticancer activity.

3- Dalia Ammar:

- MS.c. in Medicinal Chemistry, Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmacy, Jordan University of Science and Technology.
- Thesis title: “Development of carboxy and amidoxime derivatives of amino-carboxamide benzothiazole hit as histone lysine-specific demethylase 1A (LSD1) inhibitors with potential anticancer activity”.

4- Omar Hadieh:

- MS.c. in Medicinal Chemistry, Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmacy, Jordan University of Science and Technology.
- Thesis title: “Optimization of proviral integration site for moloney murine leukemia virus-1 kinase (pim-1) hit inhibitor with benzofuran-chromen-2-one scaffold as potential anticancer agents using computer-aided drug design techniques “.

Teaching

GRADUATE COURSE INSTRUCTOR

- ADVANCED DRUG DESIGN (PHAR782). Jordan University of Science and Technology (Fall, 2017; Fall, 2018; Fall, 2019; Fall 2020).
- ADVANCED ORGANIC SYNTHESIS (PHAR725). Jordan University of Science and Technology (Spring, 2015).
- ENZYMES AND DRUG ACTION (PHAR785). Jordan University of Science and Technology (Spring, 2020).
- SPECIAL TOPICS (A) (PHAR779). Jordan University of Science and Technology (Spring, 2016).

UNDERGRADUATE COURSE INSTRUCTOR

- PHARMACEUTICAL ORGANIC CHEMISTRY (PHAR222). Jordan University of Science and Technology (Spring, 2014; Fall, 2015; Fall 2018).
- MEDICINAL CHEMISTRY I (PHAR321). Jordan University of Science and Technology (Fall, 2014; Fall, 2017; Spring 2017; Fall, 2018; Fall, 2019).
- MEDICINAL CHEMISTRY I for Pharm D students (PHMD321). Jordan University of Science and Technology (Fall, 2017)

- MEDICINAL CHEMISTRY II (PHAR322). Jordan University of Science and Technology (Fall, 2015; Spring 2015; Fall, 2016; Spring 2017; Spring, 2018; Spring, 2019; Fall, 2020; Spring 2020; Spring 2021).

- MEDICINAL CHEMISTRY II for Pharm D students (PHMD322). Jordan University of Science and Technology (Spring, 2018)

- MEDICINAL CHEMISTRY III (PHAR323). Jordan University of Science and Technology (Fall, 2015)

- MEDICINAL CHEMISTRY III (PHAR421). Jordan University of Science and Technology (Fall, 2016; Spring 2018; Spring, 2021).

- MEDICINAL CHEMISTRY IV (PHAR422). Jordan University of Science and Technology (Fall, 2016; Spring 2016; Spring 2017).

- PRACTICAL COURSES IN INSTRUMENTAL ANALYSIS AND DRUG QUALITY CONTROL, PHARMACEUTICAL ANALYTICAL CHEMISTRY, MEDICINAL CHEMISTRY, PHARMACEUTICAL INSTRUMENTAL ANALYSIS, PHARMACEUTICAL MICROBIOLOGY AND BIOTECHNOLOGY, and PHARMACOGNOSY AND PHYTOCHEMISTRY. Jordan University of Science and Technology (Fall, 2007-Spring, 2010).

Committee Assignments

- Departmental Quality Assurance Committee, 2020-2021: Chair
- Departmental Scientific Research Committee, 2020-2021: Member
- Online Teaching Committee, 2020-2021: Member
- Faculty Peer Evaluation Committee, 2019-2020 and 2020-2021: Member
- Faculty Courses' Equivalency Committee, 2015-2016, 2019-2020 and 2020-2021: Member
- Conferences and Scientific Days, 2015-2016, 2018-2019 and 2019-2020: Member
- Faculty Website Committee, 2016-2017, 2017-2018 and 2019-2020: Member
- Graduates' Committee, 2018-2019: Member
- Faculty Accreditation and Quality Control Committee, 206-2017 and 2017-2018: Member
- Faculty Scientific Research Committee, 2016-2017: Member
- Faculty Laboratories and General Safety, 2016-2017: Member
- Accreditation Council for Pharmacy Education (ACPE) Central Faculty Committee, 2015-2016: Member
- Accreditation Council for Pharmacy Education (ACPE) Subcommittee No. 2, 2015-2016: chair. Working on Criteria No. 2, 3 and 5.
- Curriculum and Course Schedule Committee, 2014-2015: Member

- Faculty Social Committee, 2014-2015: Member

COMMUNITY SERVICE

- Pharmacon Campaign: “Time to Talk” activity, Jordan University of Science and Technology, Irbid, March 8, 2018.

References

1- Ian Stratford, Professor, Division of Pharmacy and Optometry, School of Health Science, Faculty of Biology, Medicine and Health, University of Manchester, Oxford Road, Manchester, M13 9PL, UK. Email: Ian.J.Stratford@manchester.ac.uk.

2- Sally Freeman, Reader, Division of Pharmacy and Optometry, School of Health Science, Faculty of Biology, Medicine and Health, University of Manchester, Oxford Road, Manchester, M13 9PL, UK. Email: Sally.Freeman@manchester.ac.uk

3- Amjad M Qandil, Professor, College of Pharmacy, King Suad Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia. Email: qandila@ksau-hs.edu.sa