# Ina L. Urbatsch, Ph.D.

Department of Cell Biology and Biochemistry
Center for Membrane Protein Research
School of Medicine
Texas Tech University Health Science Center
3601 4th Street STOP 6540
Lubbock, TX 79434-6540

Phone: (806) 743-1192
e-mail: ina.urbatsch@ttuhsc.edu

## Workload Information

| Calendar Year | Teaching % Effort | Scholarship/ Research % Effort | Clinical Service % Effort | Academically Related Public Service % Effort |
|---|---|---|---|---|
| 2023/24 | 35% | 50% | NA | 15 % |

## General Information

### Education

1987-1990 **Ph.D.** Magna cum Laude, University of Kaiserslautern, Germany, Major **in Chemistry/Biochemistry**. Advisor: Dr. Wolfgang E. Trommer

1981-1987 **Diploma in Chemistry** (equivalent to M.S.), University of Kaiserslautern, Germany, Advisor: Dr. Wolfgang E. Trommer

### Positions

2022-2023 **Director of Biotechnology**, Graduate School of Biological Sciences, Texas Tech University Health Science Center (TTUHSC), Lubbock, Texas.

2018-2022 **Graduate Advisor** for Biotechnology, Graduate School of Biological Sciences, TTUHSC, Lubbock, Texas.

2018-present **Full Professor (Tenured)**, Department of Cell Biology and Biochemistry, School of Medicine, TTUHSC, Lubbock, Texas.

2010-2018 **Associate Professor (Tenured)**, Department of Cell Biology and Biochemistry, TTUHSC, Lubbock, Texas.

2003-present Member of the Graduate School of Biomedical Sciences, School of Medicine, TTUHSC, Lubbock, Texas.

2003-2010 **Assistant Professor**, Department of Cell Biology and Biochemistry, TTUHSC, Lubbock, Texas.

1998-2003 **Research Assistant Professor**, Department of Biochemistry and Biophysics, University of Rochester, Rochester, NY.

1995-1998 **Postdoctoral Fellow** with Dr. Philippe Gros, Department of Biochemistry, McGill University, Montreal, Quebec, Canada.

1991-1995 **Postdoctoral Fellow** with Dr. Alan E. Senior, Department of Biochemistry, University of Rochester, Rochester, NY.

## Scientific Appointments and Professional Memberships

| | |
|---|---|
| 2023 | Chair of the Multi-Drug Efflux Systems Gordon Research Conference, Galveston, Texas, US. Originally scheduled for March 2021 and postponed to March 2023 |
| May 2021 | Chair and Organizer of a free series of three Gordon Research Conference ***Connects*** virtual meetings on Multi-Drug Efflux Systems to bridge the gap |
| 2020 | Cystic Fibrosis Trust, Strategic Research Centre scheme, London, UK; ad-hoc reviewer |
| 2019 | Vice-Chair of the Multi-Drug Efflux Systems Gordon Research Conference, Lucca (Barga), Italy |
| 2009-2019 | Member of the CFTR 3D structure consortium, Cystic Fibrosis Foundation Therapeutics |
| 2015 | NIH Peer Review of the NCI Laboratory of Cell Biology, review panel member |
| 2012 | The Wellcome Trust (Molecules, Genes and Cells Grants), London, UK; ad-hoc reviewer |
| 2010 | European Science Foundation (ESF); ad-hoc reviewer. |
| 2006-present | Member of the Center for Membrane Protein Research, TTUHSC, Lubbock, TX. |
| 2004-present | Member of the American Heart Association |
| 2003-present | Member of the Biophysical Society |
| 2003-present | Member of the Southwest Cancer and Treatment Center |
| 2003-present | Member of the American Association of Cancer Research |

## Honors and Awards

| | |
|---|---|
| 2023 | Honoring TTU and TTUHSC inventors who have received an issued patent during FY23, Office of Research Commercialization |
| 2023 | Elected Conference Chair, Gordon Research Conference on Multi-Drug Efflux Systems, Galveston, TX |
| 2023 | Teacher Award, Membership in Teaching Academy, SOM, TTUHSC |
| 2022 | President's Excellence in Teaching Award, TTUHSC systems, TX |
| 2021 | Dean's Outstanding Research and Student Mentor Award |
| 2021 | Dean's Teaching Award Biomedical Sciences |
| 2021 | Dean's Teaching Award Biotechnology |
| 2020 | Dean Berk's "Teacher Pin", SOM, TTUHSC, Lubbock |
| 2019 | Elected Vice-Chair, Gordon Research Conference on Multi-Drug Efflux Systems, Lucca, Barga, Italy |
| 2018 | Dean's Douglas M. Stocco Distinguished Research Award, TTTUHSC, Lubbock |
| 2016 | Dean's Unsung Hero Award, TTUHSC, Lubbock |
| 2014 | Chancellor's Council Distinguished Research Award, Texas Tech University Systems, Lubbock |
| 1992-1994 | Post-doctoral Research Fellowship from the German Research Society (DFG) |
| 1987-1989 | Pre-doctoral Research Scholarship from the Government of Rheinland-Pfalz, and the German Research Society (DFG) |

## Personal Statement

I am internationally recognized for my studies on the structure-driven functional analyses of P-glycoprotein, CFTR and mammalian ABC transporters, and my expertise in enzyme kinetics, mutational analyses, protein folding and biophysical studies. I develop expression platforms for functional evaluation of mutant proteins in mammalian and yeast cells, and for purification of highly active, structure-quality proteins, and for kinetic analyses of their substrates and inhibitors. I support protein structure determination by providing functional assessment of ligands, inhibitors and nanobodies resolved in crystal and cryo-EM structures that may reveal specific conformations and mode of action. I use this information to better understand the multidrug efflux mechanisms of transporters at the molecular level.

I have worked for over 20 years with the **multidrug transporter P-glycoprotein that poses a major impediment to chemotherapy of cancers and other diseases, and have laid some of the groundwork for its functional analyses.** In 1995, I proposed a model for alternating-site catalysis between the two nucleotide-binding domains, and have since engaged to decipher the biochemical functions of key catalytic residues. Since joining the faculty at Texas Tech University Health Sciences Center, I have optimized the *Pichia pastoris* system for milligram-scale purification of structure-quality P-glycoprotein, which was enabling to solve its structure, the first-ever X-ray structure of a mammalian ABC transporter (Science 323:1718, 2009); and I have continued to improve the resolution of the protein preparations to a reassuring 2.6 Å (eLife 2024). Recently, I have identified a pivotal loop in the substrate translocation mechanism of P-glycoprotein, visualized through substrate-bound conformations in transport-competent transition state conformations, and validated through a battery of functional assays and MD simulations. We propose a new mechanistic model of helix unwinding and rewinding for substrate translocation, which **challenges a prevailing dogma in the field**. The new mechanism may guide development of more effective suicide inhibitors that have a greater affinity and fewer side-effects in chemotherapy.

Furthermore, I have expressed more than 27 other human ABC transporters, and recently several Solute Carriers (SLC13A5) in mammalian and yeast system for small to mg-scale production of active proteins, and characterized ATPase/transport function of several of these. These studies lead to X-ray structures of the sterol transporter ABCG5/G8 in bicelles (Nature 533: 561, 2015), and ensembles of cryo-EM structures probing the “Mechanism of dual pharmacological correction and potentiation of human CFTR” (BioRxiv 2022). Directed evolution allowed us to generate fully functional cysteine (Cys)-less as well as tryptophan (Trp)-less P-glycoprotein variants that serve as background for biochemical labeling, cross-linking and drug binding studies (Scientific Reports, 2020). Site-specific single and double cysteine (Cys) probes facilitated fluorescence and luminescence resonance energy transfer (F/LRET) to enlighten the ATP-driven gating cycle of P-glycoprotein. Tryptophan (Trp) fluorescence studies have led to refined understanding of drug binding sites and substrate translocation pathways, and the molecular defects that compromise drug transport (2020 eLife 2024). A recent study on how the lipid environment modulates activity aims at tissue-specific targeting of P-glycoprotein mediated drug resistance (Front. mol. biosci. 2023).

I have served as an ad hoc **grant reviewer for NIH, the Welcome Trust, the European Science Foundation (ESF), and the Cystic Fibrosis Trust**. In addition, I have served for ten years as a principal investigator in the **CFTR3D Consortium**, a close collaboration of eleven laboratories working to obtain high quality protein reagents of the Cystic Fibrosis Transmembrane conductance Regulator (CFTR) suitable for drug screening and evaluation of correctors that ameliorate cystic fibrosis. I have successfully administered projects (e.g. staffing, research protections, budget), collaborated with other researchers, and produced several peer-reviewed publications from each project. I have served as elected Vice-Chair for the 2019 Gordon Research Conference on “Multi-drug Efflux Systems”. To bridge the gap during the Covid-19 pandemic, I have organized a series of three GRC Connects virtual events in 2021 to bring together researchers and trainees from academia and industry for advancing the frontiers of science and health worldwide. I served as organizer and **Chair of the 2023 Gordon Research Conference on “Multi-drug Efflux Systems”** that counted

115 participants, with more than half at an early career stage including graduate students and postdoctoral fellows.

In my laboratory, I have **established a battery of molecular biology, biochemical and biophysical assays** to probe structure-function relations in Pgp, CFTR, and recently the sodium-couple citrate transporter (NaCT), a member of the solute Carrier Transporter family (SLC13A5 gene). These include efficient mutagenesis procedures to generate mutant variants, whole cell drug resistance and transport assays for rapid initial screening of function, purification methods that yield very pure and active proteins (ATPase activities are among the highest reported in the field), and differential scanning calorimetry and circular dichroism spectroscopy to assess protein thermostability. I use drug-stimulated ATP hydrolysis extensively, as well as fluorescent ligand binding and transport assays, to evaluate Pgp and CFTR function and their interactions with drugs and lipids, and to validate competitive and synergistic interactions of drugs and other ligands.

**Keywords/areas of interest**

ABC transporters, Multidrug Efflux pumps, multidrug resistance, P-glycoprotein, cancer drug resistance, Cystic Fibrosis, CFTR, drug binding sites, drug-drug interactions, drug-induced toxicity.

**Manuscript Reviews for Journals**

Biochemistry
Biochimica et Biophysica Acta, Biomembranes
Biophysical Journal
British Journal of Pharmacology
Cancer Chemotherapy and Pharmacology, AACR
Cell Press Structure
Chemical Reviews
Enzyme and Microbial Technology
FEBS Letters
Journal of Biological Chemistry.
Journal of Lipid Research
Journal of Molecular Biology
Journal of Pharmacology and Drug Metabolism
Journal of Proteome Research
Molecular Cancer Therapeutics, AACR
PLOS
PLoS ONE
PNAS

**Reviews for Funding Agencies**

Cystic Fibrosis Foundation, Bethesda, US
Cystic Fibrosis Trust, Strategic Research Centre scheme, London, UK
European Science Foundation (ESF)
NIH Peer Review of the NCI Laboratory of Cell Biology, review panel member
The Wellcome Trust (Molecules, Genes and Cells Grants), London, UK
US-Israel Binational Science Foundation
School of Medicine Seed grants (internal)
School of Pharmacy Seed grants, TTUHSC, Amarillo, TX

**Consultant to government agencies, private industry, or other organizations**

**Chair and organizer of the 2023 Gordon Research Conference on Multi-Drug Efflux Systems** entitled “Pharmacological Interventions Targeting the Mechanisms and Regulation of Transporters

for Advancing Health During a Pandemic", March 26 – 31, 2023 at Hotel Galvez, Galveston, TX. The Chairs organize the meeting, select speakers, apply for grants from NIH and private sources, and raise funds to support travel and registration of young researchers and faculty.
https://www.grc.org/multi-drug-efflux-systems-conference/2023/

**Session Chair and Organizer of the Cystic Fibrosis summer research conference**, session 3 on CFTR mRNA and Protein Biogenesis, from June 25 – 27, 2023, Big Sky Montana. The session addressed specific needs on CFTR protein stability to developing gene therapies. Sponsored by the Cystic Fibrosis Foundation.

**Chair and organizer of a series of three GRC Connects virtual events on Multi-Drug Efflux Systems** in 2021 to bridge the gap until we can meet again in person in 2023.
GRC Connects: Multi-Drug Efflux Systems (1 of 3)

**Vice-Chair of the 2019 Gordon Research Conference on Multi-Drug Efflux Systems** entitled "Translating Multifaceted Molecular Mechanisms into Pharmacological Interventions for Advancing Global Health", April 28 – April 2, 2021, Renaissance Tuscany Il Ciocco, Lucca (Barga), Italy. The Vice Chairs assist with selection of speakers, grant applications, fund raising and poster evaluation.

Cystic Fibrosis Foundation Therapeutics (CFFT), Regular, **CFTR3D Consortium member**, March 2009 - 2019. The consortium discussed research in biweekly phone calls and held in-person meetings twice a year. The Committee was advisory to the CFFT board and met with industrial partners to advice on advancements in new technology for drug discovery and mode of action evaluation of potentiator and corrector drugs.

Cystic Fibrosis Foundation Therapeutics (CFFT), **consultant** to the Protein Production core housed at the University of Alabama, Birmingham, 2019 - present.

## TEACHING (35% effort)

During the past 13 years, I have taught in a total of one School of Medicine (SOM) and 20 Graduate School of Biomedical Sciences (GSBS) courses. My teaching load has averaged 2 - 4 lecture hours per year for the SOM, and 30 hours per year for the GSBS, but increased to 40 countable lecture hours in the past four years (see Table below). As part of this effort, I have been the course director for the Core IV seminar series for the past 5 years and co-director since 2014 (see Educational Administration), as well as co-director for the Laboratory Methods for Biotechnology students since 2019. I have directed Research in Biotechnology, Biotechnology Report/Final Report, and Laboratory Methods (Rotations) for the past two years. In my functions as Biotechnology Graduate Student Advisor (from 2018 - 2022) and Director of Biotechnology (Lubbock campus, June 2023 – October 2024), I have conducted monthly virtual meetings to guide our ~20 students, provide advice on course work, and encourage social interactions during the pandemic. My student evaluations have been constantly above average and in 2020 I received Dean Berk's "Teacher" pin for effectively delivering of course content to medical students. I have been a member of the Core Curriculum Coordination Committee since 2014. As elected Chair (2019-2021, and again 2023-2025), I organized monthly meetings with course directors and staff to discuss our student's academic performance and helpful interventions, and also communicated updates on Covid-19 guidance during the 2020/2021/2022 semesters. In addition, I have mentored 6 PhD students, 12 Biotech and 1 MBA Master's students, and 11 Postdocs. I have served on 18 PhD student committees, 2 MD/PhD and 19 Master's student committees. Furthermore, I have supervised 8 medical research technicians and 24 undergraduate students. I have enjoyed connecting High School students to science at the HSC (see educational activities for the lay public). I received the prestigious President's Excellence in Teaching Award in 2022.

## Teaching Experience, Lectures taught at TTUHSC:

**Summary of Annual Scheduled Teaching** (contact hours given for Spring/Summer/Fall 2023)

| Course Prefix and Number | Course Name | School | Lecture contact hours | Number of students enrolled |
|---|---|---|---|---|
| MSCI5109 | General Principals (GPX, Block II) | SOM | 2 | 220 |
| GSBS 5471 | Core I: Molecules (General Biochemistry) | GSBS | 7 | 18 |
| GSBS 5174 | Core IV: Biomedical Seminar Series, **Director *** | GSBS | 16 | 18 |
| GSBS 5099 | Core V: Introduction to Biomedical Research | GSBS | 1 | 6 |
| GBCM 6333 | Advanced Protein Biochemistry | GSBS | 12 | 12 |
| GBTC 5020 | Biotechnology Laboratory Methods, **Co-Director *** | GSBS | 10 | 10 |
| GBTC 5337 | Laboratory Methods (Rotations), **Director *** | GSBS | 2 | 7 |
| GBTC 5098 | Techniques in Biomedical Research, **Director *** | GSBS | 1 | 11 |
| GBTC 5199/5299 | Biotechnology Report/Final Report, **Director *** | GSBS | 2 Spring, 1 Fall | 10 |

| | | | | |
|---|---|---|---|---|
| GBTC 5298 | Biotechnology Internship Report, **Director *** | GSBS | 2 Spring, 2 Fall | 2 |
| GBTC 6000 | Research in Biotechnology, **Director *** | GSBS | 3 | 1 |
| GBTC 7000 | Research in Biotechnology, **Director *** | GSBS | 19 | 7 |
| | Total contact hours | | 82 | |

* See also Course Directorship below and SERVICE

**Other Lectures taught:**

GBTC 6202 Biomedical Informatics (2010-2013, 2 hours)
GBTC/BTEC 6301 Biotech course (2006-2010, 4 hours)
GBCH 5421 General Biochemistry Graduate Course, now Core I (2006-2010, 6 hours)
GBCH 6222 Problem Solving (2007-2009, 2 hours)
GBCH 6335 Special Topics course (2009, 10 hours)

**Other Teaching** (see also Education Administration): Small group conferences, and laboratories for undergraduate students, medical students, graduate students, and residents and fellows, and other students

GBCM 7101 Seminar Course, Co-Director (2012-2020, 15-20 hours)
GBTC 6001 Biotechnology Internship (2018-2023, 4 hours)
GBTC 5298 Biotechnology Internship Report (2018-2023, 4 hours)
GBCM 7000 Research (Summer, Fall, Spring 2021 - 2024)
GBMG 7000 Research (Summer, Fall, Spring 2005 – Fall 2017)
GMB 7000 Research (Summer, Fall, Spring 2013 – 2016
GBCM 8000 001 Doctoral Dissertation (Spring 2010, Fall 2012, Fall 2017)
GMB 8000 001 Doctoral Dissertation (Spring 2017)
GBCM 8000 001 Doctoral Dissertation (Summer 2020)
GTNP 7000 001 Research (Spring, Summer, Fall 2018 – 2022)
GTNP 8000 001 Doctoral Dissertation (Spring 2023)

## Group and individual Coaching:

As **Graduate Advisor and later Program Director of Biotechnology** (Lubbock Campus), I coached 11 first-year and 8 second-year students in 2021/2022, the number of 1st year enrollments was down to 5 in 2022/2023. I first get to know students during the application screening and interview process as member of the Biotech student selection committee. I contact admitted students and facilitate paid student assistant positions in faculty labs for those students needing part time jobs (Biotech Master's students are not paid in the first two semesters); this includes advisory sessions on selecting a faculty mentor and available projects. I meet 1st year students during Core IV seminar review sessions throughout the fall semester and usually arrive 20 min early to chat with students on daily issues. As a member of the Core Curriculum Coordination committee, I monitor student's academic performance, instigate sessions on Expert Skills learning methods for all students, and help struggling students get back on track. Together with graduate advisor Kumar Palle, I gave updates on student performance and communicate pertinent issues at our Biotech Program Quarterly meetings and at Graduate Council. I respond to emails within a day and keep an open-door policy.

Some of the advisory hours that are countable are as follows:
New student orientation for Biotechnology, August 10, 2023: 2 hours
On demand counseling sessions on curriculum issues (struggling students): on average two 20 min sessions for select 1st year students, ~3-4 students, total ~2.5 hours
1st year Biotech student scheduled individual advising sessions (~30 min each per student in mid-November, 10 students) to help them register for spring classes and electives, and choose two faculty labs for spring rotations which could give them a potential match for their 2nd year internship. 5 hours
2nd year Biotech students, scheduled individual advising sessions (~30 min each per student in mid-November, 11 students) to help them register for missing electives and keep them on track for graduation. 5.5 hours
Biotech Connect: A monthly virtual Zoom meeting with all 1st and 2nd year students to provide advice on course work and address student's wellbeing, ~ ten one-hour sessions, for a total of 10 hours.

**Biotech Connect:** A monthly virtual Zoom meeting with all 1st and 2nd year students to provide advice on course work and address student's wellbeing, particularly during the pandemic. Ten one-hour sessions, for a total of 10 hours

## Course Directorship: Number of courses: 6

| Course Prefix and Number | Course Name | School | organizing, scheduling, and contact hours | Number of students enrolled |
|---|---|---|---|---|
| GSBS 5174 | Core IV: Biomedical Seminar Series, **Director** | GSBS | see below | 18 |
| GBTC 5020 | Biotechnology Laboratory Methods, **Co-Director** | GSBS | see below | 10 |
| GBTC 5337 | Techniques in Biotechnology Research (Rotations), **Director *** | GSBS | 3 | 7 |
| GBTC 5298 | Biotechnology Internship Report, **Director *** | GSBS | 2 | 2 |
| GBTC 5199 | Biotechnology Final Report, **Director *** | GSBS | 2 | 10 |
| GBTC 6001/7000 | Research in Biotechnology, **Director** | GSBS | see below | 7 |

GSBS 5174, Core IV: is a high-profile Biomedical Seminar Series for all GSBS graduate students across the four concentrations, several TTUHSC programs and centers of innovation. We contact faculty from each PhD student concentration, the Biotechnology program and the Cancer Center, the Center for Membrane Protein Research, and the Laura W. Bush Center of Women's Health for help identifying renowned speakers on current topics.

Organizing this seminar course takes about 80-100 emails to department chairs and faculty to schedule seminar speakers, ask for presentation materials and coordinate events. I usually start in April to have a syllabus ready by August. Last year my co-director helped organize 2 of the 8 events.

GBTC 5020, Biotechnology Laboratory Methods: We contact faculty to offer diverse biomedical methods experiences in their laboratory. 15 faculty were engaged last year and we required students to choose 8 of them. We keep a record of attendance and grades. Scheduling the methods sections for a small, limited number of students per lab and session was particularly challenging during the pandemic.

GBTC 5337, Techniques in Biotechnology Research (rotations)
Course Description: In Spring semester of Year 1, Biotechnology students are required to rotate in at least two faculty members' laboratories. Each rotation is for half a semester (~8 weeks). The objective is to allow student to learn multiple experimental techniques and approaches, and choose a faculty mentor in which to conduct research. Co-Directors advise students on faculty and lab choices and help them match with faculty for their 2nd year paid internship. Rotation plans should be confirmed with the course director and the GSBS Biotechnology Student Advocate to ensure they are initiated timely and completed in full.

GBTC 5199, Biotechnology Report (Fall 2022) and GBTC 5299 (Spring 2023), and GBTC 5298 (Fall Spring for external internships in industry) Report/Final Report.
Course Description: At the beginning of the YR2 Fall Semester, Biotechnology students are required to form a committee consisting of at least three Biotechnology Faculty, which must include their mentor, one of the three course directors, and at least one other member of the Biotechnology Program. Students present their data in three committee meetings scheduled for November, February/March, and the final meeting before April 21. Each committee has one of us Co-Directors to observe procedures are followed, and to report a grade for Fall and Spring semesters. I was on 6 student committees, see below.
Number Enrolled: 8, Fall 2022 and Summer 2023

*GBTC 6001 Biotechnology external Internship, Texas Tech University Health Sciences Center
Course Description: Research and training in a private-sector or government biotechnology laboratory (by prior arrangement with program director). Co-directors are both assigned as committee members of students completing an industry internship to assure the work is research oriented and committee meetings occur satisfactory.
Number Enrolled: 1, Summer 2023, Spring 2023, and Fall 2022

*GBTC 7000 Research in Biotechnology (internal Internship), Texas Tech University Health Sciences Center
Number Enrolled: 7 in Fall 2022 and Spring 2023; Numbers Enrolled: 4, Summer 2023

*GSBS 5098 Techniques in Biomedical Research, Texas Tech University Health Sciences Center
Course Description: Through rotations in different laboratories, students will be introduced to fundamental principles and techniques in basic biomedical research.
Number Enrolled: 1, Summer 2023

**Coordinated events for the following courses:**
GBTC 6202 Biomedical Informatics, Texas Tech University Health Sciences Center
Course Description: Provides a broad introduction to the field of bioinformatics in medical research. Emphasizes use of modern software packages and internet-based genomic and other databases to solve research problems. Personal laptop meeting the GSBS laptop guidelines is required. Prerequisite: GSBS 5373 or by permission of the instructor. Required course for Biotechnology Master's students for Spring, Year 1.
Number Enrolled: 6, Spring 2023

GBTC 6301 Introduction to Biotechnology, Texas Tech University Health Sciences Center
Course Description: Broad coverage will be given to topics with high current interest and utility to the biotechnology industries. The course emphasizes the application of technologies and is required for all Biotechnology Master's students in Year 1 Spring semester.

Number Enrolled: 5, Spring 2023

GSBS 5099 Core V: Introduction to Biomedical Research, Texas Tech University Health Sciences Center
Course Description: Each concentration introduces faculty members who are interested in recruiting PhD or MS Biotechnology students. Students also learn how to pick a mentor and lab for their research projects.
Number Enrolled: 6, Fall 2023

## Directed Student Learning, Trainees (present and past):

**Postdoctoral fellows, research associates and visiting scientists: Total 11**

Valeria Jaramillo-Martinez, Ph.D., Research Associate, May 2023 – present. **Valeria graduated top of her class** and received the K. Wyatt McMahon Outstanding Graduate Student Award from the Graduate School of Biomedical Sciences. She continuous postdoctoral studies on two collaborative projects in the lab, indeed she took the lead on developing both projects for which I am actively seeking funding.

Maria Simakova, Ph.D., Research Associate, June 2023 – present.

Anthony Bui, Ph.D., Research Associate, January 2020 – February 2021.

Ellen Hildebrandt, Ph.D., Senior Research Associate, December 2009 – June 2019 supported by URBATS06XX0, “Purification of full-length CFTR proteins”. She edited a book chapter for Molecular Cloning published in 2012, is fist author on papers published in 2014, 2015 and 2016, and co-authored papers in 2011, 2014, 2014, 2017, 2018 and 2019. She has presented her work

Douglas J. Swartz, a former graduate student, joined my lab as a Postdoctotal Fellow and was awarded a prestigious Postdoctoral Fellowship from the American Heart Association, July 2013 – June 2015. He is now a tenure-track Assistant Professor at Lubbock Christian University and continues to collaborate on research projects. He co-authored a PNAS paper in 2013, was first author in Biosci Rep. in 2014, co-authored a paper in BBA, Biomembranes in 2015, and in J. Biol Chem in 2017, and was first author in Scientific Reports in 2020. He presented posters of his work at national (FASEB, Gordon conference) and international (FEBS) meetings. He joined my lab as a graduate student in 2007, and stayed as Postdoctoral Fellow from December 2012 - July 2015.

Leo Mok, Ph.D., Postdoctoral Fellow from December 2010 – July 2014, supported by RP101073, “Molecular mechanisms of novel inhibitors of the multidrug resistance P-glycoprotein”. He co-authored a paper in J Biol Chem in 2017. He now works as a Transporter biologist at Amgen in San Francisco, CA.

Jiangping Bai, Ph.D., he did a short Postdoctoral fellowship in my lab from January to July 2010 before he took an Assistant Professorship at the Gansu Agricultural University in Lanzhou, China. He returned as a visiting Research Assistant Professor from January to March 2011. He is first author on a publication BBM, Biomembranes in 2011.

Jyh Yeuan Lee, Ph.D., Postdoctoral Fellow, April 2006 – April 2009. He is first author on a JBC publication in 2009, coauthored publications in 2007 and 2010, and was awarded a Postdoctoral Fellowship from the American Heart Association South Central Affiliate in 2009. He continued his work as a Postdoctoral Researcher II with collaborators Drs. Helen Hobbs and Jonathan Cohen at UT Southwestern Medical Center at Dallas, and is now an Assistant Professor at the University of Ottawa, Canada. His work has culminated in solving the X-ray structure of the cholesterol transporter ABCG5/ABCG8 in bile acid-lipid bicelles, and was published in Nature 2016.

Hui Mao, M.D., Senior Research Associate, March - September 2009. She worked for a short time on the purification of CFTR, and then followed her husband to the Cedars-Sinai Medical Center Institute in Los Angeles, CA.

Arthi Krishnakunamar, Ph.D., Postdoctoral Fellow, July 2008 – January 2009. She worked for a short time on the purification of CFTR and returned to crystallography in Dr. Mark Greene's lab at the University of Pennsylvania School of Medicine, PA.

Rupeng Zhuo, Ph.D., Postdoctoral Fellow, February 2006 – December 2008. He coauthored a Science paper in 2009, a publication in 2011, and presented Posters at several national meetings (ABC meetings in Bethesda). He is currently a PostDoc at the University of Utah.

**Graduate students (Committee Chair): total 12 MS and 6 PhD students**

Nghi (Skyler) Tran graduated with a Masters in Biotechnology in May 2022, and continues as a PhD student in the Biochemistry and Molecular and Cellular Biology Concentration. She presented her work on a Poster at the Annual Center for Membrane Protein Research in 2021, at the Student Research week in 2022, and at the Biophysical Society meeting 2022 and 2023 in San Francisco and San Diego. Her poster abstract was selected for an invited 5 min flash-talk presentation at the Biophysical Society meeting in Philadelphia, February 2024, sponsored by a travel fellowship. She is first author on an original article in Front Mol Biosci. in 2023 (IF of 4.8), and significantly contributed to a high-profile article as co-author in *eLife* (2024, IF 9.9).

Devin Mangold, Master's Thesis Committee Chair, MS Biotechnology, June 1, 2023 - May 10, 2024. He is a co-author on a manuscript in preparation.

Matthew Guerra, Master's Thesis Committee Co-Chair, MS Biotechnology, September 1, 2023 - August 10, 2024.

Simranjeet Kaur, is a first-year student in the Biotechnology Master Program and has worked part-time on a research project in the lab since September 2023.

**Past**

Valeria Jaramillo-Martinez **graduated top of her class and received the K. Wyatt McMahon Outstanding Graduate Student Award** from the Graduate School of Biomedical Sciences on May 10, 2023. She received her PhD from the Translational Neurosciences and Pharmacology concentration, and started a new project on the SLC13A5 transporter involved in brain epilepsy in my lab. She presented a Poster at the Biophysical Society meeting 2020 in San Diego. She published a first-author paper in Chemical Reviews, 2021 (Impact factor IF of >54), is 1st author on an invited Commentary by Biochem J 2021, 1st author on an invited Chapter for Methods in Molecular Biology (2021), and co-authored papers in Biochem J. (2020, 2021, IF of 3.8), Metabolites (2021, IF of 4.9), and Front Mol Biosci. 2023. Total of 6 publications.

Rozenn Kenny Moundounga, is enrolled in the Master's in Biotechnology Program and expected to graduate in May, 2024. She conducted a research project in the lab September 2022 – March 2023.

Geetha Priya Boligala graduated with a Master's in Biotechnology May 2021. She conducted a research project in the lab October 2019 – December 2019.

Courtney Katz, graduated with a Masters in Biotechnology in May 2019, and continued as a PhD student in the Molecular Biophysics Concentration. She presented her work on a Poster at the Annual Center for Membrane Protein Research in 2018, at the Student Research week in 2019, and at the Biophysical Society meeting 2020 in San Diego. She is coauthor on a manuscript to be submitted.

Benjamin Jackson graduated with a Master's in Biotechnology May 2020. He conducted a research project in the lab from October 2018 – May 2019, and is coauthor on a manuscript to be submitted. He was accepted to TTHUSC SOM with a scholarship for minority backgrounds.

Bradley Schniers, conducted a research project in the lab from March 2017, and continued during his first year after joining our PhD graduate program in Biochemistry & Molecular Genetics; he continued as a member of Yangzom Bhutia's lab and graduated in May 2022.

Bala Meenakshi Purna, graduated with a Ph.D. in Biochemistry and Cellular and Molecular Biology (BCMB), TTUHSC in December 2017. She started in my lab as an intern in June 2011 and graduated with an MS in Biotechnology (TTU track) in May 2012. She joint our Biochemistry and Molecular Genetics (BMG, now BCMB) program as a PhD student to pursue her project on Cystic Fibrosis and was supported by The CH Foundation. She presented her work at the annual North American Cystic Fibrosis Conference in 2014, 2015, and 2016 (national meetings with >3,000 attendees), is first author on a publication in Protein Engineering, Design and Selection (PEDS) in 2017, and is co-author in BBA Biomembranes in 2018.

Greg Fendley, PhD student in Cell Physiology and Molecular Biophysics, December 2013 – May 2017, served as Co-Chair. He started in our Biotechnology program and received his MS in May 2013. He continued his work on ABC transporters, co-chaired by Drs. Altenberg and Urbatsch, and is first author on a paper that was accepted for publication in Biochemical and Biophysical Research Communications (BBRC) without revision (!), and co-author on a paper just published in the Journal of Biological Chemistry. He currently pursues a Postdoc at the University of California at Merced near San Francisco.

Narong Sok, M.S. student in Biotechnology since September 2014 and graduated in May 2016. He worked as an Undergraduate Research Assistant in my lab from November 2012 and graduated with a major in Biochemistry from TTU in August 2014. He continued in our Biotechnology program and presented his work at Student Research Week in 2016. He now works as a laboratory technician in Dallas, TX.

Douglas J. Swartz, graduated with a Ph.D. in Biochemistry and Molecular Genetics (BMG), TTUHSC in December 2012. He is first author on three publications and co-authored a PNAS paper in 2013; he presented Posters of his work at national (FASEB, Gordon conference) and international (FEBS) meetings. He joined my lab as Postdoctoral Fellow in January 2013, see above. He currently is an Assistant Professor at Lubbock Christian University.

Anukriti Singh, she started an internship in my lab as a M.S. student in Biotechnology (TTU track) in March 2012 and graduated in May 2013. She continued the work in my lab as a Technical Assistant, was promoted to Research Associate in March 2017, and returned to India in July 2017. She co-authored papers in Biosci Rep. in 2014, in J. Biol Chem in 2017, in BBA, Biomembranes in 2017, and Scientific Reports in 2020.

Sri Karan Botta, he graduated with a Master of Business Administration (MBA) at the Raws College of Business, TTU in December 2011. He was an intern in my lab from January-December 2011 and co-authored a paper in 2014. He currently works as an asset manager for a Biotech company in Hartford, CT.

Ryan Fleischman, M.S. in Biotechnology (TTUHSC track) in May 2011. His Poster presentation won 2$^{nd}$ prize at our Student Research Week in 2011. He is now on the technical staff at the Children's Nutrition Research Center in the Texas Medical Center, Houston.

Brandy Harvey Johnson, Ph.D. in Cell and Molecular Biology (CMB), TTUHSC in May 2010. She is first author on two publications. She is now a Professor at the School of Math, Science, and Engineering, Central New Mexico Community College in Albuquerque.

Dorinda (Gaelle) Tchipandi, M.S. in Biotechnology (TTUHSC track) in May 2010. She pursued a Ph.D. in Biotechnology and Engineering at the University of Nebraska Medical Center.

Lindsay Stalcup, M.S. in Biotechnology (TTUHSC track) in May 2005, Biotechnology, Texas Tech University Health Sciences Center. She works in Rapid City, South Dakota.

**Graduate Committee Memberships (served as member): total 18 PhD, 2 MD/PhD, 19 MS**

Yash Mehta, Dissertation Committee Member, Pharmaceutical Sciences, Texas Tech University Health Sciences Center, MS, March 23, 2023 - Present.

**Past**

Megan Skains, Master's Thesis Committee Member, MS in Biotechnology, June 1, 2022 - May 7, 2023. She is now enrolled in our PhD program in the Cell Physiology and Molecular Biophysics concentration. She is one of a few who obtained a **prestigious pre-doctoral fellowship from the American Heart Foundation**.

Joshua J Theriot, Master's Thesis Committee Member, MS in Biotechnology, June 1, 2022 - May 7, 2023. He won a price for poster presentation at the 2023 Multidrug Efflux Systems Gordon conference in Galveston, Texas. He is now working as a Medical Tech at UT Southwestern, Dallas.

Anne Pierre, a Biotech Master student August 2022 – May 2023, is now working as a medical Tech in a TTUHSC research lab.

Ibrahim Shawky, a Biotech Master student August 2022 – May 2023, he took the MCAT early September and is applying for Medical School.

Shrushty Govany, a Biotech Master student August 2022 – May 2023, is now employed in Industry in Philadelphia.

Michael Wright, Dual degree JD/Biotech Master student, June 2021 – May 2023. He is planning on taking the board exam in patenting this summer.

Glody Mbaki, a Biotech Master student August 2021 – May 2022, is now working as a Tech in a Biotech company.

Matthew Rasberry, a Biotech Master student August 2021 – May 2022, is a certified EMS technician and is currently studying for MCAT.

Thomas Germain, Chair of the Qualifying Exam Committee 2021, Dissertation Committee Member, Molecular Biophysics August 2020 – December 2021; this student finished with a MS and is now enrolled in the business school for an MBA.

Nhi Ngyuen, a Biotech Master student August 2020 – May 2021, is now enrolled in our PhD program.

Nicholas Evans, a Biotech Master student August 2020 – May 2021, is now enrolled in the PhD program at Birmingham, Alabama.

Alyssa Nagle, Biotech Master student, August 2020 – May 2021. She has secured a Technical Assistant position in Houston, TX.

Matthew Dominguez, Chair of the Qualifying Exam Committee 2021, Dissertation Committee Member, Molecular Biophysics August 2020 – December 15, 2023. He is one of a few who obtained a **prestigious pre-doctoral fellowship from the American Heart Foundation**.

Evan Van Aalst, Dissertation Committee Member, Chemistry and Biochemistry, TTU, Lubbock TX, August 2020 – May 10, 2023.

Isaak Scott, former Biotech Master student is now enrolled in our PhD program in Molecular Biophysics, Qualifying Committee Member 2020, Dissertation Committee Member, August 2019 – August 2023.

Bojana Ristic, Dissertation Committee Member, Biochemistry and Cellular and Molecular Biology, June 2016 – August 2020. She returned to her home country Serbia.

Elham Pirayesh, Biotech Master Committee Member, Biotechnology, June 2015 – May 2016, and Dissertation Committee Member, Molecular Biophysics, August 2017 - 2020. She found a well-paying job in Industry.

Manual Ramos, MS, Biotech Master Committee Member, Biotechnology, June 2019 – May 2020. He took the board exam in patenting, and found employment at a well-paying law firm.

Chris Hornback, Biotech Master Committee Member, Biotechnology, June 2018 – May 2019. He currently works as a Technician at the TTUHSC, Lubbock.

Brian Johnson, Biotech Master Committee Member, Biotechnology, June 2018 – August 2019. He conducts his external internship as a Research Technologist II at Northwestern University, Division of Rheumatology.

Faraz Harsini, Biotech Master Committee Member, Biochemistry and Cellular and Molecular Biology, August 2014 – May 2015. He continued his PhD in Molecular Biophysics, and graduated in May 2019. He works at a Biotech company in Austin, Texas.

Ashly Hindle, Ph.D. Dissertation Committee Member, Cell Biology and Biochemistry, December 2012 – May 2019. He currently works as a Postdoc at the TTUHSC, Lubbock.

Courtney Jarvis, PhD, Master's Committee Member, Immunology and Molecular Microbiology, December 2013 – May 2015. He graduated with a PhD in Immunology and Molecular Microbiology, in May 2018. He took a job in a local Biotechnology company.

Mina Ahmadi, Biotech Master Committee Member, Biotechnology, June 2016 – May 2017. She enrolled at the University of Minnesota as PhD student.

Swapneeta Date, Ph.D. Dissertation Committee Member, Cell Physiology and Molecular Biophysics, January 2014 – May 2016. She is currently a PostDoc at Columbia University in New York City, NY.

Zeno Yates, Biotech Master Committee Member, Biotechnology, June 2015 – May 2016. He worked for a year as a Laboratory Technician at the TTUHSC, and then enrolled in our Medical School.

Eric Edwards, Ph.D. Dissertation Committee Member, Biochemistry and Molecular Genetics, November 2012 – 2016, and will graduate with a Master's and an MBA in August 2016. He has accepted a lucrative job at a Biotech company in Ft. Collins, CO.

Michael Holliday, he graduated with the Ph.D. part of his MD/PhD studies in May 2012 and graduated with an M.D. from the SOM, Lubbock in 2014. He received the Achievement Rewards for College Scientists (ARCS) Scholarship, and went on for a residency at St Mary's Hospital, CT.

Rebecca Cooper, Ph.D. in Cell Physiology and Molecular Biophysics (CPMB) from June 2008 to May 2013. She was awarded a predoctoral fellowship from the American Heart Association (AHA) in 2011. She is now a postdoctoral fellow at Harvard University in Boston.

Arup Chakraborty, Ph.D. in the Department of Biological Sciences, TTU, Lubbock in December 2011. He continues as a Postdoc at the National Institute of Health (NCI) in Bethesda.

Jason Cooper, he graduated with the Ph.D. part of his MD/PhD studies in May 2011 and graduated his M.D. with honors in 2013. He was matched to the Massachusetts' General Hospital in Boston, named the # 1 hospital in the US.

Mitesh Sanghvi, Ph.D. in Pharmacology and Neurosciences, TTUHSC, in May 2008. He is currently a PostDoc at the NIH National Institute for Aging.

Shyla Narasimhachar, Ph.D. in CMB at TTUHSC, May 2009. Shyla moved to Houston for a Postdoc position.

Rolando DelAguilla, M.S. in Biochemistry, 2005. He took a BioTech job in Spain.

**Medical students: total of 2**

Amanda Pickert, Medical Student Summer Research Program in 2005 and 2006. She graduated with an M.D. in May 2009 and started her residency in Oklahoma in Dermatology. She rejoined my lab from April to May 2009 to keep up her research skills sponsored by the Cardiovascular Center FOAP. She won prizes for poster presentations at our Student Research Week in 2006 and 2007, and co-authored publications in 2007 and 2010.

Shilo Souza, November 2003 – May 2005, part-time Medical Student Assistant. She won first prize for her poster presentation at Student Research Week in 2005 and co-authored a publication in 2007. She took a Residency in El Paso where she now practices Gynecology.

**Undergraduate students**

Total of **27** Undergraduate Research Assistants between 2003 and 2023. Kimberly Williams, Sumeet Baghat, Kenneth Scott, Paulina Gonzales, Oscar Gonzales, Brandon Bailey, Mandy Gerek, Christopher Zolasky, Katie Anderson, Ramona Spurbeck, Dixa Bakta, Henry Heiser, Alicia Browder, Dayo Kazeem, Esther Goff, Sumantha Nimma, Nethanji Kumarapathiranalage, Patrick Yu, Kimberly Munoz, Daniel Yates, Narong Sok, José Bonilla, Joshua Thomas, Yu Jung Nam, Joel Zapata, Hannah Weaver (TTU Honors college).

Undergraduate Research Assistants typically help for a couple of years with general lab duties such as growth of yeast cultures, membrane preparations and protein purifications before they move on to graduate studies. Dr. Urbatsch gives them an excellent research experience and their work is acknowledged in many publications.

**Of note:**

Hannah Weaver came to my lab through the TTU Honor's College and is a CISER fellow. She was supported by an administrative supplement for summer research experiences on grant 1R01GM141216.

Joel Zapata is an Undergraduate Research Assistant from TTU with a major in Biology and a minor in chemistry. He started a research project in the lab in July 2019, and continued to work part-time during the semester. He was accepted to the PharmD program at UT Southwestern, Dallas, TX. He significantly contributed to a high-profile article as co-author in *eLife* (2024, IF 9.9).

**SABR Students**

Esther Goff, Henry Heiser, Christopher Zelasko, Sandya Nair and Delphine Jean.

**Technicians/Research Associates**

Anukriti Singh, Patina Harrell, Henry Heiser, Trinh YenPhuong, Zhanling Wang, Uma Paramashiva, Lan Wu, and Jeannie Griffin.

## Non-Credit Instruction

## Educational activities for the lay public:

**High School Summer Science Camp**, co-Chair of organization committee of inaugural summer camp, July 2017, and co-Chair of organization committee for the 2018 summer camp. Number of participants: 15

Arranged for **UIL Science High School Students** to attend Student Research Week events March 2016-2018. Number of students participating: 10

Red Bag Tour: Lubbock Cooper High School student visit to TTUHSC, Exploring careers in the Health Sciences, January 2018, Number of Participants: 60.

**High School student visit to TTUHSC**, Exploring careers in the Health Sciences, Lubbock Cooper High School, February 2017, Number of Participants: 60.

Organized **seminar at Lubbock Cooper High School**, Protein Science in Space, October 2015. Number of students participating: 60

## Innovations in Education:

**Chair** and organizer of the prestigious **Gordon Research Conference on Multi-Drug Efflux Systems**, entitled " Targeting the Mechanisms and Regulation of Transporters for Advancing Health During a Pandemic", elected Chair and organizer, March 2023. The conference had 115 attendees, mostly graduate students and postdocs that met for the first time since the pandemic lock down https://www.grc.org/multi-drug-efflux-systems-conference/2023/

**Chair and organizer of a series of three Gordon Research Conference "Connects" virtual events on Multi-Drug Efflux Systems** to bridge the gap during the pandemic and foster scientific interactions between graduate students, postdocs and principle investigators worldwide. The three sessions had more than 100 attendees from North America, Europe, Asia and Australia. Graduate students and postdocs presented their research in 7 min Short Talks followed by 4 min Q&A sessions; principle investigators moderated concluding 30 min networking sessions: May 2021 https://www.grc.org/grc-connects-multi-drug-efflux-systems-1-of-3/default.aspx

**Vice-Chair** of the **Gordon Research Conference on Multi-Drug Efflux Systems**, entitled "Pharmacological Interventions Targeting the Mechanisms and Regulation of Transporters for Advancing Health Worldwide", elected Vice-Chair and co-organizer, April 2019. **Symposium Chair** on "New Approaches for Understanding the Function of Membrane Transporters". The conference had 150 attendees, mostly graduate students and postdocs. https://www.grc.org/multi-drug-efflux-systems-conference/2019/

**High School Student Introduction to the World of Science**, Educational Program for Local High School Students, TTUHSC, March 2017 (see also Educational activities for the lay public)

Description: I invited UIL Science students and their coach from Lubbock Cooper High School to attend a seminar by an invited speaker during our GSBS student research week. After the seminar, I took them on a tour of different research labs, including my own, to give them a taste of biomedical research. Attendees: 8

**High School Student Introduction to the World of Science**, Educational Program for Local High School Students, TTUHSC, March 2016 (see also Educational activities for the lay public)

Description: I invited UIL Science students and their coach from Lubbock Cooper High School to attend a seminar by a Nobel Laureate during our GSBS student research week. After the

seminar, I took them on a tour of different research labs, including my own, to give them a taste of biomedical research. Attendees: 10

**High School Student Introduction to the World of Science**, Educational Program for Local High School Students, TTUHSC, March 2015 (see also Educational activities for the lay public)

Description: Invited a f**ormer Astronaut to give a seminar at Lubbock Cooper High School**, entitled “Protein Science in Space”, October 2015. Number of students participating: 60

## SERVICE (15% effort)

I have served on 7 committees related to educational administration in the Graduate School of Biomedical Sciences (GSBS), two in Cell Biology and Biochemistry, and I was elected as one of three TTUHSC Faculty Senators representing the GSBS. In addition, I have served on two educational SOM committees, and four related to faculty affairs, and was recently elected to the FCEC. As indicated on pages 4-5, I review manuscripts for several journals, review grants for several agencies including the Cystic Fibrosis Foundation, Cystic Fibrosis Trust, European Science Foundation, a Peer Review of the NCI Laboratory of Cell Biology at NIH, and I serve as a consultant to the Protein Production core supported by the Cystic Fibrosis Foundation Therapeutics (CFFT).

**Educational Administration** (see also Teaching: Coaching and Course Directorship)

**Program Director of Biotechnology,** May 2022 – October 2023.
People Impacted: Students, Number of Participants: 23

GSBS **Biotechnology Graduate Advisor**, (see also Positions, and Coaching), September 2018 – May 2022. People Impacted: Students, Number of Participants: 8-10 every year

**Course Directorship**

GSBS 5174 **Director of Core IV**: Biomedical Seminar Series, August 2018 - present; Co-Director, September 2014-2017

GBTC 5020 **Director of Biotechnology Laboratory Methods**, August 2019 - 2021; Co-Director, September 2017-2018, 2022-2023

GBTC 5350 **Director of Laboratory Methods** (Spring Rotations), 2023

GBTC 5098 **Director of Techniques in Biomedical** Research (Summer), 2022, 2023

GBTC 5199 **Director of Biotechnology Report**, 2023

GSBS 5299 **Director of Final Report**, 2023

GBTC 7000 **Director of Research in Biotechnology**, 2022-2023

**Educational Committees: total of 7 GSBS and 3 CBB committees**

**GSBS Core Curriculum Coordination Committee (CCCC)**, member September 2014-present.
I currently **chair the CCCC** that oversees training of all incoming graduate students (PhD and MS) to provide a solid and broad foundation that allows students to excel in any of our four basic sciences' concentrations. The CCCC is composed of the course directors of the GSBS core curriculum our first-year students take in the fall semester, and faculty representatives from each concentration from both the Abilene and Lubbock campuses. The CCCC has developed and annually reviews a rigorous, relevant curriculum that provides fundamental knowledge relevant to all biomedical sciences concentrations, and closely monitors student performance. We identify struggling students and offer early interventions to help students perform better. During the pandemic last year, we coordinated a mixture of in-person, hybrid and zoom classes that offered flexibility to students and faculty, and kept us all safe!
We meet monthly in the fall to discuss student's performance and adjustments to the curriculum to incorporate new emerging knowledge and technologies to meet the highest standards of graduate school education.
People Impacted: Graduate students in PhD and MS programs, Number of students: 15-22 each year

**Chair**, September 2019 – July 2021, and again July 2023 - 2025. Elected to coordinate meetings and lead the discussions. Elected **Vice-Chair**, July 2021 – July 2023.

**GSBS Biotechnology Program Committee Member**, August 2016 - present. Meets quarterly to discuss student's performance and organizational issues.

**GSBS PhD student Selection Committee Member**, December 2015 - December 2022. The committee meets most every Friday between late December and early April to discuss applications that we review and score ahead of the meeting, and to interview qualified candidates. Students with little or no research experience are referred to the Biotech Master's program. This year (2020/2021), we reviewed 39 student's applications, interviewed ~30 students, recommended 18 to the admissions committee who offered admission to all of them; a total of 10 students accepted admission. Last year (2019/2020), we screened and interview a similar number of students but GSBS capped the number of students admitted at 4.

**GSBS Biotech Student Selection Committee Member**, August 2016 – present, committee Chair June 2022 – October 2023. The committee meets on demand between January and late May to review and interview applicants. Dr. Bergeson and I review applicants from the TTUHSC Recruit website, schedule and conduct interviews and file our final report with the GSBS. On average, we review about 25+ applications, interview about 18-20 promising candidates and make offers to about 15 students, with a target goal of 10 acceptances for admission to the Master's program.

**GSBS Graduate Council Representative** for BCMB, March 2016 – December 2022

**GSBS BMG Concentration Committee Member**, April 2013 – August 2015.

**GSBS SACS Accreditation Review Committee**, PN Graduate Program, Nov. 2013 - February 2014.

**CBB Seminar Review Committee Member**, January 2010 – present,
**Co-director** January 2016 - 2020.

**CBB Graduate Program Concentration Committee member** of Biochemistry and Molecular Genetics (BMG), April 2013 - August 2015.

**CBB Equipment Committee Member**, September 2004 – present,
**Chair**, June 2016 - 2020.

**<u>SOM and TTUHSC committees</u>: total of 7 SOM and 3 TTUHSC committees**

**SOM Faculty Council Executive Committee**, September 2023 - August 2025.
FCEC members have responsibilities in striving to achieve and maintain excellence in all aspects of medical education, research, and service in all components of the School of Medicine. They review and make recommendations on matters such as admissions, curricula, standards of instruction, student conduct, student promotions, graduation, or any other matters which may affect the pursuit of academic excellence.

**SOM Hearing Committee**, September 2023 - August 2026.
It is the policy of the TTUHSC to affirm the right of its students to a prompt and fair resolution of a complaint or grievance involving allegations of inappropriate behavior by other TTUHSC students or by TTUHSC personnel toward students.

**SOM Grievance Committee**, August 2022 – August 2025.

**SOM Student Promotions & Professional Conduct Committee**, (SPPCC) Educational Policy Committee, August 2022 - August 2025.
Year 1-2 subcommittee: The mission is to develop and implement policies and procedures that ensure that students in the TTUHSC SOM achieve the highest standards of academic performance and professional behavior.

**SOM Faculty Development Leave Committee**, February 2022 – August 2024.

**SOM Post Tenure Faculty Peer Review Committee Member**, November 2018 – August 2021, January 2023 - present.
Comprehensive Performance Evaluation of Tenured Faculty, Policy OP 20.23

**SOM Search Committee for the Chair of the Department of Cell Physiology and Molecular Biophysics**, TTUHSC, Lubbock, September 2021-July 2022.

**TTUHSC Research Renovation Task Force**, committee member for Cell Biology and Biochemistry, January 2022-present.

**TTUHSC Faculty Senator for the Graduate School of Biomedical Sciences** (GSBS), September 2019 – 2021; ad-hoc representation 2021-present.

President's Awards Committee Member, July 2019 – present. Leader of the selection of the President's Excellence in Research Awards in 2020, 2021, and again in 2022. We usually review and scored 5 to 7 applicants.

**TTUHSC Radiation Safety Committee Member**, 2005 - 2015.

**Public, Local (see also Innovation in Education)**
High School Summer Science Camp Organization Committee, 2019. Program Organizer
High School Summer Science Camp Organization Committee, 2018. Program Organizer

High School Summer Science Camp Organization Committee, 2016 - 2017. Program Organizer

Lubbock Cooper High School, Seminar Organization, 2015. Program Organizer

## Faculty Development Activities Attended

Teaching Academy, School of Medicine Teaching Academy, January 2023 - present.

Webinar, 2023 TTUHSC Compliance Symposium, Office of Institutional Compliance, TX, October 2023.

Faculty Development Course (FDC), NIH Grant Writing Seminar, Research, Innovation, Collaboration, and Entrepreneurship (RICE), Lubbock, TX, September 2023.

Advanced Teaching and Technical Writing (ATTW), Dean's Grand Rounds: Improving the Learning Environment: Eliminating Student Mistreatment, TTUHSC School of Medicine, Lubbock, August 2023.

Chair training, Organization of a Gordon Research Conference, Gordon Research Conference office, Orlando, Florida, January 2020.

Faculty Development Course (FDC), Annual Age Discrimination webinarx, Office of General Council - TTU System, Lubbock, TX, August 2023.

Faculty Leadership Study Group, Lessons, Life and Leadership Seminar Series, Texas Tech University Health Sciences Center, Lubbock, Texas, Number of Credit Hours: 8, September 2016 - April 2017

Faculty Leadership Study Group: Lessons, Life and Leadership Seminar Series for Women Faculty in Academic Medicine September 2015 - April 2016.

## SCHOLARSHIP (50% effort)

**Google Scholar *h*-index: 36**

https://scholar.google.ca/citations?user=fkvqbPMAAAAJ&hl=en

I have published 81 peer-reviewed papers that are referenced in NCBI's PubMed, that have been cited more than 8259. I am particularly proud of our publication in Science magazine (impact factor IF of 64) on the structure of the P-glycoprotein multidrug transporter in 2009 which has been cited in Google Scholar more than 2,300 times and is one of the most cited papers in the transporter field. My continuous strive to decipher the mechanism of drug binding and transport and ever-increasing resolutions has resulted in a stream of papers published in top-tier journals include Trends Biochem Sci. in 2010 (IF of 13.8), PNAS in 2013 (IF of 12.8), Acta Crystallographica in 2015 (IF of 5.7), Structure in 2015 (IF of 5.9), Front Mol Biosci. in 2023 (IF of 4.8), and recently in eLife (2024, IF 9.9). My work on the related human sterol transporter ABCG5/ABCG8 lead to a prestigious publication in Nature in 2016 (IF of 69.5) that has been cited more than 270 times. Studies of the Cystic Fibrosis Conductance regulator are published in Nature Commun. (2019, IF of 16.6), Biochim Biophys Acta., Membranes (2014, 2017, 2018, IF of 4.0), and recently in BioRxiv (was reviewed by Nature). and have led to a patented invention "Stabilized Variants and Uses of CFTR Protein". Collaborative studies with Dr. Ganapathy, Bhutia and Karamyshev at TTUHSC on the Na-coupled citrate transporter have led to a string of publications in Chemical Reviews in 2021 (IF of 60.1), Biochem J. (2021, IF of 3.8), Metabolites (2021, IF of 4.9), and Methods Mol Biol. (2022). I am also the senior author of a book chapter in the well-known Laboratory Manual "Molecular cloning," 4th edition by Green and Sambrook that has been regarded as the "bible" of molecular biology.

## **Peer-reviewed publications**: total of 81

1. Gewering T, Waghray D, Parey K, Jung H, Tran NNB, Zapata J, Zhao P, Chen H, Januliene D, Hummer G, Urbatsch I, Moeller A, Zhang Q. Tracing the substrate translocation mechanism in P-glycoprotein. Elife. 2024 Jan 23;12. doi: 10.7554/eLife.90174. PMID: 38259172. *We propose a new mechanistic model of how substrates are translocated across the membrane, which challenges a prevailing dogma in the field.*
2. Tran NNB, Bui ATA, Jaramillo-Martinez V, Weber J, Zhang Q, **Urbatsch IL**. Lipid environment determines the drug-stimulated ATPase activity of P-glycoprotein. Front Mol Biosci. 2023 Feb 23; 10: 1141081. doi: 10.3389/fmolb.2023.1141081. eCollection 2023, PMID: 36911528. *The journal has an impact factor of 5.1.*
3. Jaramillo Martinez V, Ganapathy V, Urbatsch IL (2022). Peptide Tags and Domains for Expression and Detection of Mammalian Membrane Proteins at the Cell Surface. Methods Mol Biol. 2022; 2507:337-358. doi: 10.1007/978-1-0716-2368-8_18. PMID: 35773591
4. Jaramillo-Martinez V, Sivaprakasam S, Ganapathy V**, Urbatsch IL**. Drosophila INDY and Mammalian INDY: Major Differences in Transport Mechanism and Structural Features despite Mostly Similar Biological Functions. Metabolites. 2021 Sep 29;11(10):669. doi: 10.3390/metabo11100669. PMID: 34677384 Review.
5. Jaramillo-Martinez V, Ganapathy V, **Urbatsch IL**. A home run for human NaCT/SLC13A5/INDY: cryo-EM structure and homology model to predict transport mechanisms, inhibitor interactions and mutational defects. Biochem J. 2021 Jun 11; 478(11): 2051-2057. doi: 10.1042/BCJ20210211. PMID: 34101804.
6. Jaramillo-Martinez V, **Urbatsch IL**, Ganapathy V. (Urbatsch is co-corresponding author). Functional Distinction between Human and Mouse Sodium-Coupled Citrate Transporters and Its Biologic Significance: An Attempt for Structural Basis Using a Homology Modeling Approach.

Chem Rev. 2021 May 12; 121(9): 5359-5377. doi: 10.1021/acs.chemrev.0c00529. Epub 2020 Oct 11. PMID: 33040525. ***Chem Reviews has an impact factor of 60**, cited 17 times.*

7. Higuchi K, Kopel JJ, Sivaprakasam S, Jaramillo-Martinez V, Sutton RB, **Urbatsch IL**, Ganapathy V. Functional analysis of a species-specific inhibitor selective for human Na+-coupled citrate transporter (NaCT/SLC13A5/mINDY). Biochem J. 2020 Nov 13; 477(21):4149-4165. PMCID: PMC7657661. *This article has been cited 15 times.*

8. Swartz DJ, Singh A, Sok N, Thomas JN, Weber J, **Urbatsch IL.** Replacing the Eleven Native Tryptophans by Directed Evolution Produces an Active P-glycoprotein With Site-Specific, Non-Conservative Substitution. Sci Rep. 2020 Feb 21; 10(1): 3224. PMCID: PMC7035247

9. Sigoillot M, Overtus M, Grodecka M, Scholl D, Garcia-Pino A, Laeremans T, He L, Pardon E, Hildebrandt E, **Urbatsch IL**, Steyaert J, Riordan JR and Govaerts C. Domain-interface Dynamics of CFTR Revealed by Stabilizing Nanobodies. Nature Communications 2019 June; 10(1): 2636 2019. PMC6572788 *Nat Commun has an impact factor of 16.6, cited 26 times.*

10. Yang Z, Hildebrandt E, Jiang F, Aleksandrov AA, Khazanov N, Zhou Q, An J, Mezzell AT, Xavier B, Ding H, Riordan JR, Senderowitz H, Kappes JC, Brouillette C G, and **Urbatsch I L.** Structural stability of purified human CFTR is systematically improved by mutations in nucleotide binding domain 1. Biochimica et Biophysica Acta, Biomembranes 2018 May;1860(5):1193-1204. PMC6319260. *This article has been cited 16 times.*

11. Zoghbi ME, Mok L, Swartz DJ, Singh A, Fendley G, **Urbatsch IL**, and Altenberg GA. Substrate binding modulates the conformational changes of the nucleotide binding domains of the multidrug transporter P-glycoprotein in a lipid bilayer. J. Biol. Chem. 2017; 292(50), 20412-20424, PubMed ID # PMC5733581. *Urbatsch is co-corresponding author, cited 69 times.*

12. Xavier BM, Hildebrandt E, Jiang F, Ding H, Kappes JC, and **Urbatsch IL**. Substitution of Yor1p NBD1 residues improves the thermal stability of Human Cystic Fibrosis Transmembrane Conductance Regulator, Protein Engineering, Design and Selection 2017 Oct 1; 30(10): 729-741. doi: 10.1093/protein/gzx054.

13. Hildebrandt E, Khazanov N, Kappes JC, Dai Q, Senderowitz H, **Urbatsch IL**. Specific stabilization of CFTR by phosphatidylserine. Biochimica et biophysica acta 2017; 1859(2), 289-293, PMCID: PMC5237360. *BBA Biomembranes has an impact factor of 3.7, cited 23 times.*

14. Yang Z, Zhou Q, Mok L, Singh A, Swartz DJ, **Urbatsch IL**, Brouillette CG. Interactions and cooperativity between P-glycoprotein structural domains determined by thermal unfolding provides insights into its solution structure and function. Biochimica et biophysica acta 2017; 1859(1), 48-60. *Urbatsch is co-corresponding author.*

15. Fendley GA, **Urbatsch IL**, Sutton RB, Zoghbi ME, Altenberg GA. Nucleotide dependence of the dimerization of ATP binding cassette nucleotide binding domains. Biochemical and biophysical research communications 2016; 480(2), 268-272.

16. Bianchi F, Klooster JS, Ruiz SJ, Luck K, Pols T, **Urbatsch IL**, Poolman B. Asymmetry in inward- and outward-affinity constant of transport explain unidirectional lysine flux in Saccharomyces cerevisiae. Scientific Reports 2016; 6, 31443, PMCID: PMC4993999. *Sci Rep. has an impact factor of 5.2.*

17. Lee JY, Kinch LN, Borek DM, Wang J, Wang J, **Urbatsch IL**, Xie XS, Grishin NV, Cohen JC, Otwinowski Z, Hobbs HH, Rosenbaum DM. Crystal structure of the human sterol transporter ABCG5/ABCG8. Nature. 2016 May 4;533(7604):561-4. PMCID: PMC4964963. ***Nature is one of the most prestigious journals worldwide with a very high impact factor of 69.5; the article has already been cited 276 times.***

18. Szewczyk P, Tao H, McGrath AP, Villaluz M, Rees SD, Lee SC, Doshi R, **Urbatsch IL**, Zhang Q and Chang G. Snapshots of Ligand Entry, Malleable Binding, and Induced Helical Movement in P-glycoprotein. Acta Crystallographica Section D, 2015; 71(Pt 3):732-41. PMCID: PMC4356375. *The article has already been cited 180 times.*

19. Moeller A, Lee SC, Tao H, Speir JA, Chang G, **Urbatsch IL**, Potter CS, Carragher B, and Zhang Q. Distinct Conformational Spectrum of Homologous Multidrug ABC Transporters. Structure, 2015; 23(3):450-60. PMCID: PMC4351144. *Structure has an impact factor of 5.9; this article has been cited 115 times.*

20. Hildebrandt E, Mulky A, Ding H, Dai Q, Aleksandrov AA, Bajrami B, Diego PA, Wu X, Ray M, Naren AP, Riordan RR, Yao X, DeLucas LJ, **Urbatsch IL** and Kappes JC. A Stable Human-Cell System Overexpressing Cystic Fibrosis Transmembrane Conductance Regulator Recombinant Protein at the Cell Surface. Mol Biotechnol. 2015 May;57(5):391-405. PMCID: PMC4405497. *Urbatsch is co-corresponding author; this article has been cited 26 times.*

21. Hildebrandt E, Zhang Q, Cant N, Ding H, Dai Q, Peng L, Fu Y, DeLucase LJ, Ford R, Kappes JF, and **Urbatsch IL**. A survey of detergents for the purification of stable, active human cystic fibrosis transmembrane conductance regulator (CFTR). Biochim Biophys Acta. 2014 Jul 24; 1838(11):2825-2837. PMCID: PMC4170525. *The article has been cited 21 times.*

22. Swartz DJ, Mok L, Botta SK, Singh A, Altenberg GA, **Urbatsch IL**. Directed evolution of P-glycoprotein cysteines reveals site-specific, non-conservative substitutions that preserve multidrug resistance. Biosci Rep. 2014 Jun 25;34(3). PMCID: PMC4069687.

23. Yang Z, Wang C, Zhou Q, An J, Hildebrandt E, Aleksandrov LA, Kappes JC, DeLucas LJ, Riordan JR, **Urbatsch IL**, Hunt JF, Brouillette CG. Membrane protein stability can be compromised by detergent interactions with the extramembranous soluble domains. Protein Sci. 2014 Jun;23(6):769-89. PMCID: PMC4093953. *This article has been cited 105 times.*

24. Ward AB, Szewczyk P, Grimard V, Lee CW, Martinez L, Doshi R, Caya A, Villaluz M, Pardon E, Cregger C, Swartz DJ, Falson PG, **Urbatsch IL**, Govaerts C, Steyaert J, Chang G. Structures of P-glycoprotein reveal its conformational flexibility and an epitope on the nucleotide-binding domain. Proc Natl Acad Sci U S A. 2013 Aug 13;110(33):13386-91. PMCID: PMC3746859. *This journal has an impact factor of 12.8; cited 280 times.*

25. Swartz DJ, Weber J, **Urbatsch IL**. P-glycoprotein is fully active after multiple tryptophan substitutions. Biochim Biophys Acta. 2013; 1828(3):1159-1168. PMCID: PMC3602414. *This article has been cited 23 times,*

26. Bai J, Swartz DJ, Protasevich II, Brouillette CG, Harrell PM, Hildebrandt E, Gasser B, Mattanovich D, Ward A, Chang G, **Urbatsch IL**. A gene optimization strategy that enhances production of fully functional P-glycoprotein in Pichia pastoris. *PLoS One* 2011; 6(8):e22577. PMCID: PMC3149604. *This article has been cited 128 times.*

27. Tao H, Weng Y, Zhuo R, Chang G, **Urbatsch IL**, and Zhang Q. Design and Synthesis of Selenazole-Containing Peptides for Co-crystallization with P-Glycoprotein. *ChemBioChem* 2011; 12(6):863-73. *This article has been cited 19 times.*

28. Schölz C, Parcej D, Ejsing CS, Robenek H, Urbatsch IL, Tampé R. Specific lipids modulate the transporter associated with antigen processing (TAP). J. Biol. Chem. 2011; 286(15):13346-56. PMCID: PMC3075681. *JBC has an impact factor of 4.3; cited 36 times.*

29. Hoffman AD, Urbatsch IL, Vogel PD. Nucleotide binding to the human multidrug resistance protein 3, MRP3. Biochemistry. 2010 Apr 27; 49(16):3403-11

30. Gutmann DAP, Ward A, Urbatsch IL, Chang G and vanVeen HW. Understanding polyspecificity of multidrug ABC transporters: closing in on the gaps in ABCB1. Trends Biochem Sci. 2010; 35(1):36-42. *This journal has an impact factor of 14.2; cited 167 times.*

31. Johnson BJ, Lee JY, Pickert A, **Urbatsch IL**. Bile acids stimulate ATP hydrolysis in the purified cholesterol transporter ABCG5/G8. Biochemistry. 2010; 49(16):3403-11. *This article has been cited 52 times.*

32. Aller SG, Yu J, Ward A, Weng Y, Chittaboina S, Zhuo R, Harrell PM, Trinh YT, Zhang Q, **Urbatsch IL**, and Chang G. Structure of P-glycoprotein Reveals a Molecular Basis for Poly-Specific Drug Binding. Science 2009; 323:1718-22. PMCID: PMC2720052 ***Science Magazine is one of the most prestigious journals worldwide with an impact factor of 64; the article has been cited over 2,326 times.***

33. Zehnpfennig B, Urbatsch IL and Galla HJ. Functional reconstitution of human ABCC3 into proteoliposomes reveals a transport mechanism with positive cooperativity. Biochemistry 2009; 48:4423-30. *This article has been cited 22 times.*

34. Lee JY, **Urbatsch IL**, Senior AE, and Wilkens S. Nucleotide-induced Structural Changes in P-glycoprotein observed by Electron Microscopy. *J. Biol. Chem.*, 2008; 283(9):5769-79. *This article has been cited 89 times.*

35. Chloupkova M, Pickert A, Lee, JY, Souza S, Trinh Y, Connelly SM, Dumont ME, Dean M, and **Urbatsch IL**. Expression of 25 human ABC transporters in the yeast *Pichia pastoris* and Characterization of the Purified ABCC3 ATPase Activity. *Biochemistry* 2007; 46(27):7992-8003. *This article has been cited 55 times.*

36. Carrier I, **Urbatsch IL**, Senior AE, Gros P. Mutational analysis of conserved aromatic residues in the A-loop of the ABC transporter ABCB1A (mouse Mdr3). *FEBS Lett*. 2007; 581(2): 301-8.

37. Wang Z, Stalcup LD, Harvey BJ, Weber J, Chloupkova M, Dumont ME, Dean M, **Urbatsch IL.** Purification and ATP Hydrolysis of the Putative Cholesterol Transporters ABCG5 and ABCG8. *Biochemistry* 2006; *45(32),* 9929-9939. *This article has been cited 52 times.*

38. Tombline G, **Urbatsch IL**, Virk N, Muharemagic A, White LB, Senior AE. Expression, purification, and characterization of cysteine-free mouse P-glycoprotein. *Arch Biochem Biophys*. 2006; 445(1):124-8. *This article has been cited 91 times.*

39. Delannoy S, **Urbatsch IL**, Tombline G, Senior AE, Vogel PD. Nucleotide Binding to the Multidrug Resistance P-Glycoprotein as Studied by ESR Spectroscopy. *Biochemistry* 2005; 44(42):14010-14019. *This article has been cited 57 times.*

*40.* Tombline, G., Bartholomew, L.A., Tyndall G.A., Gimi, K., **Urbatsch, I.L**., and Senior, A.E. Properties of P-glycoprotein with mutations in the "catalytic carboxylate" glutamate residues. *J. Biol. Chem.*, 2004; 279: 46518-46526. *This article has been cited 91 times.*

*41.* Tombline G, Bartholomew LA, **Urbatsch IL**, Senior AE. Combined mutation of catalytic glutamate residues in the two nucleotide binding domains of P-glycoprotein generates a conformation that binds ATP and ADP tightly. *J Biol Chem*. 2004; 279(30):31212-20. *This article has been cited 118 times.*

42. **Urbatsch IL,** Tyndall GA, Tombline G, and Senior AE. P-glycoprotein catalytic mechanism. Studies of the ADP-vanadate inhibited state. J. Biol. Chem. 2003; 278**,** 23171 - 23179. *This article has been cited 114 times.*

43. Lee JY, **Urbatsch IL**, Senior AE, and Wilkens S. Projection Structure of P-glycoprotein by electron microscopy: evidence for a "closed" conformation of the nucleotide binding domains. J. Biol. Chem. 2003; 277, 40125-31. *This article has been cited 129 times.*

44. **Urbatsch IL**, Gimi K, Wilke-Mounts S, Lerner-Marmarosh N, Rousseau ME, Gros P, and Senior AE. Cysteine-431 and Cysteine-1074 are responsible for inhibitory disulfide crosslinking between the two nucleotide binding sites in human P-glycoprotein. J. Biol. Chem. 2001; 276, 26980-26987. *This article has been cited 92 times.*

45. **Urbatsch IL**, Wilke-Mounts S, Gimi K, and Senior AE. Purification and characterization of N-glycosylation mutant mouse and human P-glycoproteins expressed in Pichia pastoris cells. Arch. Biochem. Biophys. 2001; 388, 171-177.

46. **Urbatsch IL**, Gimi K, Wilke-Mounts S, and Senior AE. Investigation of the role of Glutamine-471 and Glutamine-114 in the two catalytic sites of P-glycoprotein. Biochemistry 2000; 39, 11921-11927. *This article has been cited 94 times.*

47. **Urbatsch IL**, Julien M, Carrier I, Rousseau ME, Cayrol R, and Gros P. Mutational analysis of conserved carboxylate residues in the nucleotide binding sites of P-glycoprotein. Biochemistry 2000; 39, 14138-14149. *This article has been cited 106 times.*

48. **Urbatsch IL**, Gimi K, Wilke-Mounts S, and Senior AE. Conserved Walker A Ser residues in the catalytic sites of P-glycoprotein are critical for catalysis and involved primarily at the transition state step. J. Biol. Chem. 2000; 275, 25031-25038. *This article has been cited 67 times.*

49. Kwan T, Loughrey H, Brault M, Gruenheid S, **Urbatsch IL**, Senior AE, and Gros P. Functional analysis of a tryptophan-less P-glycoprotein: a tool for tryptophan insertion and fluorescence spectroscopy. Mol. Pharm. 2000; 58, 37-47.

50. Lerner-Marmarosh N, Gimi K, **Urbatsch IL**, Gros P, and Senior AE. Large-scale purification of detergent-soluble P-glycoprotein from Pichia pastoris and characterization of nucleotide-binding properties of wild-type, Walker A, and Walker B mutant proteins. J. Biol. Chem. 1999; 274, 34711-34718. *This article has been cited 184 times.*

51. Senior AE, Al-Shawi MK, and **Urbatsch IL**. ATPase activity of Chinese hamster P-glycoprotein. Methods Enzymol. 1998; 292, 414-523.

52. Senior AE, Gros P, and **Urbatsch IL**. Residues in P-glycoprotein catalytic sites that react with the inhibitor 7-chloro-4-nitrobenzo-2-oxa-1,3-diazole. Arch.Biochem. Biophys. 1998; 357, 121-125.

53. Gros P, Beaudet L, and **Urbatsch IL**. Yeast as an expression system for the study of P-glycoprotein and other ABC transporters. Acta Physiol. Scand. Suppl. 1998; 643, 219-225.

54. Beaudet L, **Urbatsch IL**, and Gros P. High level expression of mouse MDR3 P-glycoprotein in yeast Pichia pastoris and characterization of ATPase activity. Methods Enzymol. 1998; 292, 397-413.

55. Beaudet L, **Urbatsch IL**, and Gros P. Mutations in the nucleotide-binding sites of P-glycoprotein that modulate substrate induced ATPase activity. Biochemistry 1998; 37, 9073-9082.

56. **Urbatsch IL**, Beaudet L, Carrier I, and Gros P. Mutations in either nucleotide binding site prevent vanadate trapping of nucleotide at both sites. Biochemistry 1998; 37, 4592-4602. *This article has been cited 169 times.*

57. Senior AE, Al-Shawi MK, and **Urbatsch IL**. The catalytic cycle of P-glycoprotein. FEBS Lett. 1995; 377, 285-289. *This article has been cited 390 times.*

58. **Urbatsch IL**, Sankaran B, Baghat S, and Senior AE. Both P-glycoprotein nucleotide binding sites are cata¬lytically active. J. Biol. Chem. 1995; 270, 26956-26961. ***This article has been cited 623 times.***

59. **Urbatsch IL**, Sankaran B, Weber A, and Senior AE. P-plycoprotein is stably inhibited by vanadate-in¬duced trapping of nucleotide at a single catalytic site. J. Biol. Chem. 1995; 270, 19383-19390. ***This article has been cited 470 times.***

60. Senior AE, Al-Shawi MK, and **Urbatsch IL**. ATP hydrolysis by multidrug-resistance protein from Chinese hamster ovary cells. J. Bioenerg. Biomembr. 1995; 27, 31-16.

61. **Urbatsch IL**, and Senior AE. Effects of lipids on ATPase activity of purified Chinese hamster P-glycoprotein. Arch. Biochem. Biophys. 1994; 316, 135-140. *This article has been cited 153 times.*

62. **Urbatsch IL,** Al-Shawi MK, and Senior AE. Characterization of the ATPase activity of purified Chinese hamster P-glycoprotein. Biochemistry 1994; 33, 7069-7076. *This article has been cited 278 times.*

63. Al-Shawi MK, Urbatsch IL, and Senior AE. Covalent inhibitors of P-glycoprotein ATPase activity. J. Biol. Chem. 1994; 269, 8986-8992. *This article has been cited 191 times.*

64. Urbatsch IL, Sterz RK, Peper K, and Trommer WE. Antigen-specific therapy of experimental myasthenia gravis with acetylcholine receptor-gelonin conjugates in vivo. Eur. J. Immunol. 1993; 23, 776-779.

**Protocols listed in PubMed:**

65. Kielkopf CL, Bauer W, Urbatsch IL. Analysis of Proteins by Immunoblotting. Cold Spring Harb Protoc. 2021 Dec 1;2021(12):pdb.prot102251. doi: 10.1101/pdb.prot102251. PMID: 34853123

66. Kielkopf CL, Bauer W, Urbatsch IL. Staining Sodium Dodecyl Sulfate-Polyacrylamide Gels with Silver Salts. Cold Spring Harb Protoc. 2021 Dec 1;2021(12):pdb.prot102244. doi: 10.1101/pdb.prot102244. PMID: 34853122.

67. Kielkopf CL, Bauer W, Urbatsch IL. Variations of Staining Sodium Dodecyl Sulfate-Polyacrylamide Gels with Coomassie Brilliant Blue. Cold Spring Harb Protoc. 2021 Dec 1;2021(12):pdb.prot102236. doi: 10.1101/pdb.prot102236.PMID: 34853121

68. Kielkopf CL, Bauer W, Urbatsch IL. Sodium Dodecyl Sulfate-Polyacrylamide Gel Electrophoresis of Proteins. Cold Spring Harb Protoc. 2021 Dec 1;2021(12):pdb.prot102228. doi: 10.1101/pdb.prot102228. PMID: 34853120. *This article has been cited 18 times.*

69. Kielkopf CL, Bauer W, **Urbatsch IL**. Expressing Cloned Genes for Protein Production, Purification, and Analysis. Cold Spring Harb Protoc. 2021 Feb 1;2021(2). doi: 10.1101/pdb.top102129. PMID: 33272973

70. Kielkopf CL, Bauer W, **Urbatsch IL**. Expression of Cloned Genes in Pichia pastoris Using the Methanol-Inducible Promoter AOX1. Cold Spring Harb Protoc. 2021 Jan 4;2021(1). doi: 10.1101/pdb.prot102160. PMID: 33397779

71. Kielkopf CL, Bauer W, **Urbatsch IL**. Preparation of Cell Extracts for Purification of Proteins Expressed in Pichia pastoris. Cold Spring Harb Protoc. 2021 Jan 4;2021(1). doi: 10.1101/pdb.prot102186. PMID: 33397780

72. Kielkopf CL, Bauer W, **Urbatsch IL**. Considerations for Membrane Protein Purification. Cold Spring Harb Protoc. 2021 Jan 4;2021(1). doi: 10.1101/pdb.top102285. PMID: 33397781

73. Kielkopf CL, Bauer W, **Urbatsch IL**. Expression of Cloned Genes in E. coli Using IPTG-Inducible Promoters. Cold Spring Harb Protoc. 2021 Feb 1;2021(2). doi: 10.1101/pdb.prot102137. PMID: 33526417

74. Kielkopf CL, Bauer W, **Urbatsch IL**. Subcellular Localization of Signal Peptide Fusion Proteins Expressed in E. coli. Cold Spring Harb Protoc. 2021 Feb 1;2021(2). doi: 10.1101/pdb.prot102145. PMID: 33526418

75. Kielkopf CL, Bauer W, **Urbatsch IL**. Preparation of Cell Extracts for Purification of Soluble Proteins Expressed in E. coli. Cold Spring Harb Protoc. 2021 Feb 1;2021(2). doi: 10.1101/pdb.prot102178. PMID: 33526419

76. Kielkopf CL, Bauer W, Urbatsch IL. Solubilization of Expressed Proteins from Inclusion Bodies. Cold Spring Harb Protoc. 2021 Feb 1;2021(2). doi: 10.1101/pdb.prot102210.PMID: 33526420

77. Kielkopf CL, Bauer W, **Urbatsch IL.** Purification of Polyhistidine-Tagged Proteins by Immobilized Metal Affinity Chromatography. Cold Spring Harb Protoc. 2020 Jun 1; 2020(6): 102194. doi: 10.1101/pdb.prot102194. PMID: 32482902

78. Kielkopf CL, Bauer W, **Urbatsch IL**. Purification of Fusion Proteins by Affinity Chromatography on Glutathione Resin. Cold Spring Harb Protoc. 2020 Jun 1; 2020(6): 102202. doi: 10.1101/pdb.prot102202. PMID: 32482903

79. Kielkopf CL, Bauer W, **Urbatsch IL.** Expression of Cloned Genes Using the Baculovirus Expression System. Cold Spring Harb Protoc. 2020 Jun 1; 2020(6): 102152. doi: 10.1101/pdb.prot102152.PMID: 32354747. *This article has been cited 28 times.*

80. Kielkopf CL, Bauer W, **Urbatsch IL.** Methods for Measuring the Concentrations of Proteins. Cold Spring Harb Protoc. 2020 Apr 1; 2020(4): 102277. doi: 10.1101/pdb.top102277.PMID: 32238598

81. Kielkopf CL, Bauer W, **Urbatsch IL.** Bradford Assay for Determining Protein Concentration. Cold Spring Harb Protoc. 2020 Apr 1; 2020(4): 102269. doi: 10.1101/pdb.prot102269.PMID: 32238597. *This article has been cited 225 times.*

**List of published work in My Bibliography** (total of 81 publications)
https://www.ncbi.nlm.nih.gov/myncbi/ina.urbatsch.3/bibliography/public/

**Not (yet) Peer-reviewed**

82. Chi Wang C, continue to collaborate with prior tYang Z, Loughlin BJ, Xu H, Veit G, Vorobiev S, Clarke OB, Jiang F, Li Y, Singh S, Rich Z, Menten ER, Grassucci RA, Wang W, Mezzell A, Fu Z, Wong KH, Wang J, Wetmore DR, Sutton RB, Brouillette CG, Urbatsch IL, Kappes JC, Lukacs GL, Frank J, Hunt JF, Mechanism of dual pharmacological correction and potentiation of human CFTR, preprinted in BioRxiv Oct 11, 2022; doi: https://doi.org/10.1101/2022.10.10.510913

**Book Chapters:**

Kiehlkopf C, Bauer W, and **Urbatsch IL**. Expressing cloned genes for protein production, purification and analysis. Invited chapter in Green M and Sambrook J, *Molecular cloning*, 4th edition CSHL Press, July 2012. *This is the well-known Laboratory Manual originally published by Sambrook and Maniatis*

Harvey BH, Lee JY and **Urbatsch IL**. Sitosterolemia, book chapter in Encyclopedia of Molecular Mechanisms of Disease, Lang, F. (Ed.), ISBN 978-3-540-33445-3, Springer, pp1941-1943 (2009).

**GenBank submissions**:

ACCESSION MZ367587, Synthetic construct HSS*-NaCT gene, complete cds 2199 bp

ACCESSION MZ367588, Synthetic construct HSS*GFP-NaCT gene, complete cds, 2952 bp.

ACCESSION JF834158, 3855 bp DNA linear, SYN 02-SEP-2011, Synthetic construct P-glycoprotein gene, complete cds, VERSION JF834158, GI:332693032.

ACCESSION KP202880, 5610 bp DNA linear, SYN 22-APR-2015, Synthetic construct SUMO*-CFTR.FLAG-EGFP gene, complete cds, VERSION KP202880.1, GI:808035088

**Patents:**

**US 20,130,011,909A1** (2012) Methods and composition to enhance production of fully functional p-glycoprotein in *Pichia pastoris.* The invention provides codon optimization to increase protein production by providing a target gene, wherein the expression of the target gene is to be optimized; providing a codon usage frequency table; replacing low-frequency codons in the target gene with corresponding high-frequency codons that code for the same amino acid; and harmonizing the a distribution of codon frequencies to those of the set of highly expressed native gene over an open reading frame, wherein the optimized gene encodes an amino acid sequence identical to the respective wild-type (native) amino acid sequence.

**US 11,560,413** (2023) Modified cystic fibrosis transmembrane conductance regulator (CFTR) polypeptides with increased stability and uses thereof. The present invention is directed to modified CFTR proteins or fragments thereof that contain single or multiple amino acid mutations to improve the structural stability of such CFTR proteins and/or fragments. Specifically, the modified CFTR proteins or fragment thereof differ from the wild-type human CFTR protein or fragment thereof by the presence of four or more mutations selected from V150D, M470V, S492P, F494N, S495P, A534P, I539T, G550E, G551D, R553Q, R555K, Q637R, S1255L, K1334G, S1359A, E1371Q, H1402S, Q1411D, and any combination thereof, such that the stability of the polypeptide is increased relative to that of the wild-type human CFTR polypeptide or fragment thereof.

## Presentations/Exhibits/Productions

### Invited Podium Presentations

I have been invited to speak at platform presentations at national and international meetings including five Gordon Research Conferences, a Biophysical Society Annual Meeting, a FEBS Special Meeting, the European Cystic Fibrosis Conference, and the North American Cystic Fibrosis Conference (NACFC), and have organized two workshops for the NACFC. I was elected Chair of the 2023 Gordon Research Conferences on Multi-drug Efflux Systems, and Vice-Chair of that conference in 2023. In addition, I organized three GRC Connects virtual events (May 2021) to foster communication between graduate students and Postdocs during the pandemic.

2023 Ina Urbatsch, **moderator** of a session on ”CFTR mRNA and Protein Biogenesis” at the Cystic Fibrosis Foundation Summer Research Conference in Big Sky, Montana, June 25 – 29, 2023.

2023 Ina Urbatsch, Conference **Chair** of the **Gordon Research Conference on Multi-Drug Efflux Systems** themed “New Approaches for Understanding the Function of Membrane

Transporters, Pharmacological Interventions Targeting the Mechanisms and Regulation of Transporters during a Pandemic" at Hotel Galvez, Galveston, TX, March 25 – 31, 2023 (postponed from 2021). I gave the introductory and concluding remarks.

2022 Ina Urbatsch, "Drug binding to distinct sites of the multidrug exporter P-glycoprotein". **Invited symposium** speaker at the **Gordon Research Conference** on Ligand Recognition and Molecular Gating, Structure and Dynamics of Ion Channels, G-Protein Coupled Receptors, and Solute Transporters at the Renaissance Tuscany Il Ciocco, Lucca (Barga), Italy, March 20 - 25, 2022 (postponed from 2020).

2021 Chair and organizer of a series of three **Gordon Research Conference** "***Connects***" virtual events on Multi-Drug Efflux Systems: https://www.grc.org/grc-connects-multi-drug-efflux-systems-1-of-3/default.aspx Each meeting had more than 100 attendees from North America, Europe, Asia and Australia.

2020 Ina Urbatsch, "Drug binding to distinct sites of the Multidrug exporter P-glycoprotein". **Co-Chair** and **invited speaker** of the **Platform**: Membrane Pumps, Transporters, and Exchangers at the **Biophysical Society** 64th Annual Meeting, San Diego, CA from February 15-19, 2020.

2019 Ina Urbatsch, Conference **Co-Chair** and **symposium Chair** "New Approaches for Understanding the Function of Membrane Transporters of the **Gordon Research Conference on Multi-Drug Efflux Systems**, Translating Multifaceted Molecular Mechanisms into Pharmacological Interventions for Advancing Global Health, April 28 – May 2, 2019 at the Renaissance Tuscany Il Ciocco Lucca (Barga), Italy.

2018 Ina Urbatsch, Patrick Thibodeau, **workshop organizers** "CFTR: Structure Function & Dynamics of CFTR Ion Channel" and **workshop speaker** "Functional stabilization of purified human CFTR by NBD1 mutations and by conformation", 2018 North American Cystic Fibrosis Conference (**NACFC**, Denver, CO, October 2018. *This conference had over 5,000 participants*

2018 Ina Urbatsch, Multidrug Resistance P-glycoprotein: Lipid and drug Interactions, and cooperativity between structural domains. Invited lecturer at the University of Duesseldorf, Germany, July 1, 2018.

2018 Ina Urbatsch, Structural stability of purified human CFTR is systematically improved by mutations in NBD1, and by specific phospholipids. **Invited symposium speaker** at the 2018 **Gordon Research Conference on Membrane Transport Proteins**: From Physiology to Disease, at Sunday River, Newry, ME, from June 10 - 15, 2018.

2017 Ina Urbatsch, Interactions and cooperativity between P-glycoprotein structural domains determined by thermal uncoupling and LRET. **Invited symposium speaker** at the **Gordon Research Conference on Multi-Drug Efflux Systems**, Integrated approaches to understanding the role of multi-drug efflux systems in health and disease, March 26-31, 2017 in Galveston, TX. At the meeting, I judged posters and participated in the Power Hour to help address challenges women face in science**. I was elected co-Chair for the next meeting in 2019, and Chair for 2021.**

2016 Ina Urbatsch, Thermal stabilization of purified CFTR by mutations in the nucleotide binding domains and by specific phospholipids. Poster abstract was selected for **oral presentation** in the **CFTR workshop** 12: Understanding and Stabilizing CFTR Structure. 30th Annual North

American Cystic Fibrosis conference (**NACFC**) in Orlando, FL, October 28, 2016. This meeting had over 5,000 attendees.

2016 Jyh-Juan (Eric) Lee "ABCG5/ABCG8: A Structural View on Sterol Transport" ", Invited symposium speaker at the **Gordon Research Conference on Membrane Transport Proteins**, June 12-17, 2016 at the Renaissance Tuscany Il Ciocco Lucca (Barga), Italy. I arranged for my former Postdoc to present our recently solved crystal structure of ABCG5/G8. I judged posters at the meeting.

2016 Urbatsch, I. L., Hildebrandt, E., Purna, B. Generate and test mutations known to promote folding of CFTR, and identify new mutations for their impact on folding and stability of full-length CFTR, Cystic Fibrosis Foundation Headquarters, Bethesda, Maryland, May 2016.

2015 Urbatsch, I. L., Hildebrandt, E., Purna, B. How to achieve stable and pure CFTR, CFTR3D, North American Cystic Fibrosis Meeting, NACFC, Phoenix, AR, October 2015.

2015 Urbatsch, I. L., Hildebrandt, E., Purna, B. How to achieve stable and pure CFTR, Cystic Fibrosis Foundation Headquarters, Cystic Fibrosis Foundation Headquarters, Bethesda, Maryland, May 2015.

2014 Ina Urbatsch, "Directed Evolution of P-glycoprotein Cysteines Reveals Site-specific, Non-conservative Substitutions that Preserve Multidrug Resistance", **Invited symposium speaker** at the **Gordon Research Conference** on Ligand Recognition and Molecular Gating, Structure and Dynamics of Ion Channels, G-Protein Coupled Receptors, and Solute Transporters, March 23-28, 2014 in Ventura Beach, CA.

2014 Ina Urbatsch, "How to stabilize purified CFTR", CFTR3D consortium workshop presentation at the North American Cystic Fibrosis (NACFC) meeting in Atlanta, GA, October 8, 2014.

2014 Ina Urbatsch, "How to stabilize purified CFTR", CFTR3D consortium workshop presentation at the Cystic Fibrosis Foundation headquarters in Bethesda, April 29-30, 2014.

2013 Ina Urbatsch, "How to purified CFTR in active conformation", CFTR3D consortium workshop presentation at the North American Cystic Fibrosis (NACFC) meeting in Salt Lake City, CO, October 17, 2013.

2012 Ina Urbatsch, Patrick Thibodeau, **workshop organizers and workshop speakers**, "The CFTR 3D structure consortium: development of CFTR constructs & biophysical assays to aid structure/mechanism-based CF drug discovery", 2012 North American Cystic Fibrosis Conference (**NACFC**, Orlando, FL, October 2012. *This conference had over 5,000 participants*

2012 Ina Urbatsch, "A Directed Evolutionary approach to building a Tryptophan-free P-glycoprotein for fluorescence drug binding studies" at the **4th FEBS Special Meeting** on ATP-Binding Cassette (ABC) Proteins: From Multidrug Resistance to Genetic Disease, Innsbruck, Austria, March 2012. *This conference had 500 participants*

2011 Ina Urbatsch, "Purification of CFTR from the yeast *Pichia pastoris*", **European Cystic Fibrosis Society Conference** "New Frontiers in Basic Science in Cystic Fibrosis", March 2011, Tirrenia-Pisa, Italy. *This conference had 300 participants*

2011 Ina Urbatsch, “Purification of CFTR from the yeast *Pichia pastoris*”, CFTR 3D Structure consortium satellite meeting, North American Cystic Fibrosis conference (**NACFC**), October 2011 in Anaheim, CA.

2011 Invited seminar speaker, University of Rochester Medical Center, Rochester, NY.

2010 CFTR 3D Structure Consortium meeting in Minneapolis, MN.

2009 Invited seminar speaker, John’s Hopkins, Baltimore, ML.

2009 CFTR 3D Structure Consortium meeting in Birmingham, AL.

Previously: Oklahoma State University in Stillwater, University of San Francisco, University of North Dakota in Fargo, Drexel University in Philadelphia, University of Rochester Medical Center, Baylor College of Medicine in Houston, and McGill University in Montreal (CA).
In Germany: Goethe University of Frankfurt and University of Kaiserslautern.

## Grants and Contracts Awarded:

Since July 2004, my research on mammalian ABC transporters has been continuously funded accumulating more than $5.9 million. What sets me apart, may be the diversity of funding I have been able to secure including grants from the American Heart Association (AHA), the Department of Defense (DOD), Cancer Prevention & Research Institute of Texas (CPRIT), the National Institute of Health (NIGMS-R15 AREA, NIGMS-R01), and a long-term grant from the Cystic Fibrosis Foundation Therapeutics (CFFT). I am particularly proud of sponsoring two post-doctoral fellowships from AHA, and one pre-doctoral fellowship from the TESS Foundation. I also interacted with local funding agencies and received grants from the Wilson Foundation, the CH Foundation and multiple from the South Plains Foundation (SPF). Since 2022, I have been the Principal Investigator of a NIH-R01 and in 2023, added a co-Principal Investigator on a second NIH-R01, and received Administrative Supplements to Support an Undergraduate Summer Research Experience, and an Equipment Purchase. Finally, I successfully led a Multi-PI R13 application in support of a prestigious Gordon Research Conference.

**Ongoing Support:**

NIGMS, R01 GM141216-01 Urbatsch (PI) 08/01/22-04/30/26
Studies of P-glycoprotein drug interactions
The aim of this proposal is to identify single tryptophans in strategic locations within the drug binding sites of P-glycoprotein that can distinguish binding of substrates and inhibitors of this multidrug pump and can serve to survey binding of clinically relevant drugs.
30% effort, Total Amount: $1,237,301

Administrative Supplement to 1 R01 GM141216-01 05/01/23 – 04/31/24
to support Undergraduate Summer Research Experiences,
Total Amount: $7,497

Administrative Supplement to 1 R01 GM141216-01 05/01/23 – 04/31/24
for Equipment Purchase, Total Amount: $67,508

NIGMS, R01 GM148675-01 Zhang (PI) 08/10/23 - 05/31/27
Inhibition or invasion of P-glycoprotein-mediated drug transport
The goal is to obtain a deep, molecular-level understanding of P-glycoprotein mediated drug transport and efflux inhibition. We will interrogate how P-glycoprotein discriminates transport substrates and inhibitors, in order to rationalize chemical strategies to modify drugs to evade transport by this highly polyspecific pump.
Role: Co-Investigator), 7% effort, Total Amount: $28,000

NIAID, R13AI174842-01 Urbatsch (Multi-PI, lead) 02/03/23 – 01/31/24
Conference support for the 2023 Multi-Drug Efflux Systems Gordon Research Conference
The theme was “Targeting the Mechanisms and Regulation of Multi-Drug Transporters for Advancing Health during a Pandemic”.
Total Amount: $7,000 (one of the highest funds for a Gordon Research Conferences given by NIAID in 2023)

**Pending:**

NINDS, R01 NS129824-01 Urbatsch (PI)
Pathobiochemistry of Na-coupled citrate transport in SLS13A5 epilepsy, and targeted therapeutic developments
The aims of this proposal are to (1) determine the molecular defects of all 22 known disease-causing mutations of the Na-coupled citrate transporter (SLC13A5) causing EIEE25, (2) to develop assays

for discovery screening of small molecule correctors for Class II protein folding mutations, and (3) probe the transport mechanism of Class I mutations.

**Completed Support:**

NIDDK, R01 DK055835 Hwang (PI) 05/20/19 - 04/30/23
Molecular Pathophysiology of Cystic Fibrosis.
The goal is to define the coupling mechanism between the two nucleotide-binding domains and the channel pore by complementing electrophysiology with evaluation of ATPase activity of CFTR mutant variants that address the gating mechanism.
Role: Collaborator, 5% effort

NIGMS, R01 GM118594-01 Zhang (PI) 04/01/16 - 03/31/20
NIH/NIGMS
Studies of P-glycoprotein and drug interactions.
The goal is to define how structural and chemical properties of a ligand affect its interactions with P-glycoprotein (Pgp), to characterize how it reacts to binding of different classes of ligands, and then use the knowledge gained to rationalize chemical synthesis of improved drugs that can evade Pgp transport.
Role: Collaborator, 7% effort

URBATS06XX0 Urbatsch (PI) 03/01/07-08/31/19
Cystic Fibrosis Foundation Therapeutics, Inc.
Purification of active, full-length CFTR proteins
The goal of this project is to improve and tailor detergents and methods for CFTR structural and functional studies, explore sequence variations that exhibit better protein stability, and embark on higher-resolution cryo-EM and nanocrystallography. Progress in these aims can enable studies aimed at defining and refining CFTR drug binding, and can guide drug development to treat a greater number of patients.
Total amount: $1,759,528

South Plains Foundation Urbatsch (PI) 09/01/16-08/31/17
Developing a fluorescent drug binding assay for P-glycoprotein. Seed grant to strengthen aim 1 of above NIH/R01.

The CH Foundation Urbatsch (PI) 01/01/15-12/31/15
Development of New Cost Effective Tools to Facilitate Drug Discovery for Treatment of Cystic Fibrosis.
The aim is to develop technology that allows cost-effective production of large amounts of the CFTR protein to enable structural studies and facilitate drug discovery programs and guide rational drug design.
5% effort, total amount: $60,069

NIGMS R15 GM102928 Urbatsch (PI) 09/23/12-09/22/15
Understanding polyspecific drug binding in P-glycoprotein.
The goal of this proposal is to construct a tryptophan (Trp)-free P-glycoprotein and use single Trp mutants in strategic locations to monitor binding of cancer drugs by Trp fluorescence spectroscopy.
17% effort, total amount: $347,454

NIGMS, U54-GM94610 Rees (PI) 09/29/10-06/30/15
TransportPDB: Center for the X-Ray Structure Determination of Human Transporters.

The goal is to purify 300-500 human transporters from *P. pastoris* and crystallize the proteins for X-ray structure determination.
Role: Co-Investigator, 10% effort, total amount: $114,317

13POST17070103, Swartz, D. J. (PI) 07/01/13–06/30/15
American Heart Association Southwest/Central Affiliation,
Observing Drug Interactions with P-glycoprotein through Site-specific Tryptophan Fluorescence, (Postdoc salary support for two years).
Role: Sponsor, total amount $85,972

RP101073 Altenberg (PI) 06/01/10-05/30/13
Cancer Prevention and Research Institute of Texas (CPRIT)
Molecular mechanisms of novel inhibitors of the multidrug resistance P-glycoprotein.
The goals of this grant was to define distinct conformational states of Pgp using luminescence resonance energy transfer (LRET), and to elucidate how new inhibitors block the ATP hydrolysis cycle of Pgp.
Role: Co-Principal Investigator, 17% effort, total amount $742,571

South Plains Foundation Urbatsch (PI) 09/01/11-08/30/12
Construction of a Trp-free P-glycoprotein to understand cancer drug binding in a multidrug resistant pump. Seed grant to strengthen aim 1 of NIH/R15.

W81XWH-05-1-0316 Chang (PI) 03/01/05-02/28/10
US Army/DOD
Discovery of Potent Inhibitors for Breast cancer Multidrug Resistance.
The goal of this study was to crystallize P-glycoprotein possibly with bound drugs or inhibitors to elucidate the binding sites and the mechanism of multidrug resistance by P-glycoprotein by x-ray crystallography.
Role: Co-Investigator, 10% effort, total amount $737,674

Cancer Research Grant Urbatsch (PI) 12/08/05-12/14/09
Wilson Foundation, Dallas, TX
Inhibitors of Multidrug Resistance in Breast Cancers.
The goal of this grant was to screen compounds from the NIH repositories for inhibitors of P-glycoprotein.

0465130Y Urbatsch (PI) 07/01/04-06/30/06
American Heart Association, Texas Affiliate
ABC-Binding Cassette Transporters in Sitosterolemia and Arteriosclerosis.
The goal of this proposal was to demonstrate that ABCG5 and ABCG8 are active transporters, which hydrolyze ATP to provide the energy for the transport process, and to test whether cholesterol and plant sterols stimulate the ATPase activity.

Helen Jones Foundation Urbatsch (PI) 01/01/06-12/31/06
Inhibitors of P-glycoprotein: From Natural Products to Chemical Diversity.
The goal of this Seed Grant was to a screen a subset of compounds from the NIH repositories to identify inhibitors of Pgp. This grant was intended to provide supplies for the training of a graduate student in my lab.

03-057-IU-D Urbatsch (PI) 09/01/04-08/31/05
South Plains Foundation
Sterol binding by the twinned ABC transporters ABCG5 and ABCG8.

The goal of this seed grant was to study sterol binding of the ABC transporters ABCG5 and ABCG8 using a photoreactive [3H]-sitosterol derivative.

Seed Grant Urbatsch (PI) 01/01/05-12/31/05
South West Cancer Center, Texas Tech University
Inhibitors of P-glycoprotein.
The goal of this project was to establish methods for the screening of chemical libraries to find inhibitors of multidrug resistance using the ATPase function of P-glycoprotein.

**Total external funding 2003-2024:**

| **External funding** | **Total 2003-2024** | **Since 2018** |
|---|---|---|
| National (Cystic Fibrosis Foundation Therapeutics, Department of Defense, TESS Foundation) | $ 2,164,528 | $ 207,158 |
| NIH (National Institute of General Medicine, ) | $2,015,169 | $1,474,562 |
| Texas (American Heart Association, Cancer Prevention and Research Institute of Texas) | $1,034,543 | |
| External (South Plains Foundation, Helen Jones Foundation, Wilson Foundation, The CH Foundation) | $746,369 | |
| **Grant Total** | **$ 5,960,609** | **$ 1,681,720** |