

CURRICULUM VITA

MICHAEL B. MAURIN, R.Ph., Ph.D.

Personal Married Marilyn D. Maurin
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Education University of Kentucky, College of Pharmacy, Division of Pharmaceutics, Lexington, KY. Doctor of Philosophy in Pharmaceutical Sciences, April, 1988
Major area of research focused on the application of pharmaceutical fundamentals to dosage form design. Dissertation entitled "Mechanism of Diffusion of Monosubstituted Benzoic Acids Through Ethylene-Vinyl Acetate Copolymers: Application to a Controlled Release Molluscicide" (Professor Anwar Hussain, advisor). Received University of Kentucky and MENSA Scholarships. Received graduate student research award from the American Pharmaceutical Association Foundation to support the presentation of my research at the 1987 joint Japan-United States Congress of Pharmaceutical Sciences.

University of Pittsburgh, School of Pharmacy, Pittsburgh, PA. Bachelor of Science in Pharmacy, April, 1983
Fifth year electives in parenteral products, advanced pharmaceutics, and advanced pharmacokinetics including significant laboratory experience and extensive BASIC computer language usage. Elected Senior Class President of Pharmacy School Student Government. Received the Hoffman-LaRoche Award for excellence in patient communication skills.

Experience Summary Extensive experience in pharmaceutical product development from the screening and identification of clinical candidates (over 13,500 new chemical entities and salt forms) through the development and manufacturing of stable, bioavailable, manufacturable, and registerable dosage forms for use in pivotal clinical trials and regulatory submissions (over 100 regulatory submissions and over a dozen marketed products). Founded, developed and grew technical organizations in the major Pharma and contract research organization settings. Provided leadership and mentoring to biopharmaceutics, preformulation, formulation development, analytical, GMP, and process validation operations. Technical experience includes preformulation and stability characterizations of drug substance and drug product, biopharmaceutic pharmacokinetic evaluations, and formulation development of solid dosage forms, liquid-filled capsules, oral solutions and suspensions, injectable dosage forms (terminally sterilized and lyophilized products), topical semisolids (including iontophoretic), ophthalmic, nasal and aerosol dosage forms.

Experience

- December 2009 - Present
Maurin Healthcare Consulting, LLC, Wilmington, DE Vice President
Provide consulting services that span the pharmaceutical development process from the screening and identification of new chemical entities and appropriate form (salt and/or polymorph) through the development and manufacture of stable, bioavailable, commercially manufacturable, and registerable dosage forms for use in clinical trials and regulatory submission. Provide expert witness reports and deposition/trial testimony on patent matters that include polymorphism, physical chemical properties, and dosage form invention, design and performance. As a Registered Pharmacist, provide medication therapy management services to senior citizens.
- October 2006 - Oct. 2008
QS Pharma LLC, Boothwyn, PA Vice President
A fully owned subsidiary of the WIL Research Holding Company, Inc. Provided leadership to the technical operations of the preformulation, biopharmaceutics, formulation development, analytical, GMP, and process validation operations. Grew the organization to forty-nine employees and a 48,000 ft² facility in October, 2008.
- February 2002 - Oct. 2006
QS Pharma LLC, Boothwyn, PA Founder, Owner and Vice President
Provided leadership to the technical operations of the preformulation, biopharmaceutics, formulation development, analytical, GMP, engineering and validation operations. Grew the organization to thirty-seven employees and a 23,000 ft² facility in October, 2006. Authored and served as head of R&D for contracts with values in excess of \$24.7 million. QS Pharma was founded on the tenet of *Quality with Speed*[®] based on strategic expertise and knowledge in the broadly defined area of pharmaceutical product development. Delivered a broad range of contract research services for biopharmaceutical and pharmaceutical companies worldwide. The pharmaceutical product development focus of QS Pharma spanned the development process from the screening and identification of clinical candidates and their appropriate form through the development and manufacturing of stable, bioavailable, manufacturable, and registerable dosage forms for use in pivotal clinical trials and submission. The highly proprietary and third-party nature of the scientific efforts precluded any public domain technical disclosures but did lead to authoring over 300 research proposals and forty regulatory filings.
- May 1988 - Jan. 2002
Bristol-Myers Squibb Pharma Company (formerly DuPont Pharmaceuticals Company, DuPont Merck Pharmaceutical Company and DuPont, Medical Products Department), Pharmacy R&D, Wilmington, Delaware
Experienced in establishing, developing, growing and leading a technical organization in Pharmaceutical R&D. Significant technical experience in the preformulation and stability characterizations of drug substance and drug product, biopharmaceutic pharmacokinetic evaluations, and formulation development of solid dosage forms, liquid-filled capsules, oral solutions and suspensions,

injectable dosage forms (terminally sterilized and lyophilized products), topical semisolids (including iontophoretic), ophthalmic, nasal and aerosol dosage forms.

Feb. 1998 -

Jan. 2002

Director, Biopharmaceutics & Basic Pharmaceutics

Responsible for the organization and operation of the Biopharmaceutics & Basic Pharmaceutics section of Pharmacy R&D. The section interfaced extensively with Discovery and various Development functions by providing scientific guidance to the identification of lead candidates (evaluated 3,000 new chemical entities and salt forms per year) through physical chemical characterizations, stability evaluations, *in vitro* and *in vivo* biopharmaceutic screens and preliminary formulation development. The section was responsible for the preformulation evaluations, salt or polymorph selection and Phase I formulation development for all types of dosage forms. Led a CMC team for multiple high profile antiretroviral compounds targeted for accelerated review that exceeded all CMC expectations. Recognized with internal awards as a key contributor to the development of efavirenz (Sustiva), a non-nucleoside reverse transcriptase inhibitor for the treatment of HIV. The contributions included inventorship of three patents and authorship of multiple reports and areas of the CMC section of the NDA and as a key member of the technology transfer and pre-approval inspection teams, which led to the approval of the product under an accelerated review and immediate launch with an 18-month shelf-life. Streamlined time to completion of Phase I trials via various process improvements across R&D with an average time to man from receipt of GMP drug substance to first in man dosing of 4.8 months. Provided an environment for seamless transition into subsequent formulation development for pivotal clinical trials and commercialization into stable, bioavailable, manufacturable and registerable dosage forms. Represented the Pharmaceutical R&D organization at the Discovery Portfolio Review, Research Program Review, Development Candidate Review, Development and Commercialization Board, Patent Docket Review, Foreign Patent Filing Maintenance Committee, and In-licensing Due Diligence Team. Stimulated and contributed to the authorship of technical reports, regulatory filings and publications in peer-reviewed journals. Mentored direct reports to represent Pharmacy R&D in discovery working groups, project development teams, and CMC teams. Supervised seven Ph.D. and fourteen B.Sc./M.Sc. level scientists.

Feb. 1997 -

Jan. 1998

Associate Director, Biopharmaceutics & Basic Pharmaceutics

Responsible for the establishment, organization and operation of the Biopharmaceutics & Basic Pharmaceutics section of Pharmacy R&D. Expanded and strengthened the interface with Discovery and various Development functions by providing scientific guidance to the identification of lead candidates through physical chemical characterization, *in vitro* and *in vivo* drug delivery screens and preliminary formulation development and by expediting the timely and streamlined completion of Phase I trials. Led a team responsible for the implementation of an automated robotic Caco-2 operation for growth and maintenance of cell line through transport study completion. Provided an

environment for seamless transition into subsequent formulation development for pivotal clinical trials and commercialization into stable, bioavailable, manufacturable and registerable dosage forms. Contributed significantly to the development and communication of department Vision and Mission Statement. Stimulated and contributed to the authorship of technical reports, regulatory filings and publication in peer-reviewed journals. Mentored direct reports to represent Pharmacy R&D in project development teams and discovery working groups. Supervised six Ph.D. and eight B.Sc./M.Sc. level scientists.

- Aug. 1995 - Principal Research Scientist, Basic Pharmaceuticals & Liquid Formulation
Feb. 1997 Responsible for the organization and operation of a section of the Basic Pharmaceuticals & Liquid Formulation group. The group interfaced extensively with Discovery and various Development functions. The goal was optimizing lead selection form with respect to physical, chemical and biopharmaceutical properties, assessing ultimately the stability and formulation potential and providing solutions to any associated issues. The data were integral to the Technical Basis of Nomination and the initiation of the formulation development process. Developed parenteral and oral liquid formulations for preclinical testing and clinical trials. Led the contract manufacture of a lyophilized product and was recognized with internal awards as a key contributor to the process optimization and formulation/reformulation of Cardene, Narcan, Nubain and Numorphan injectable marketed products. Represented Pharmacy R&D in project development teams and discovery working groups. Supervised one Ph.D., five B.Sc./M.Sc. level scientists and eight previous summer students.
- Aug. 1992 - Senior Research Scientist II, Basic Pharmaceuticals
July 1995 Characterized the physicochemical properties of new drug entities. Recommended the most appropriate form of the drug substance for development, i.e., particle size, stability, salt, polymorph and/or hydrate form (examined over 500 chemical entities). Troubleshot parenteral manufacturing processes for stability and particulate issues. Identified pharmaceutically acceptable dosing vehicles for water insoluble compounds for pharmacology, toxicology and drug metabolism testing. Evaluated various methods to optimize drug delivery, such as formulation techniques, prodrug modifications, alternative routes of administration and device approaches, *in vitro* and *in vivo*. Represented Pharmacy R&D in project development teams, the Predevelopment Committee, and several discovery working groups. Supervised two B.Sc./M.Sc. level scientists.
- Jan. 1991 - Senior Research Scientist, Basic Pharmaceuticals
July 1992 Responsibilities are identical to those above.
- Jan. 1989 - Research Pharmacist, Basic Pharmaceuticals
Dec. 1990 Responsibilities are identical to those above.

- May 1988 - Dec. 1988 Research Pharmacist, Preformulation and Formulation Development
 Characterized the physicochemical properties of new drug entities and excipients as well as their solid-state stability and compatibility. Contributed to the development and technology transfer of losartan potassium (Cozaar) and losartan potassium/hydrochlorothiazide (Hyzaar) tablet dosage forms. Troubleshoot solid dosage form manufacturing processes for stability and processing issues. Evaluated various methods to optimize controlled drug delivery, such as formulation techniques and site-directed drug targeting. Initiated early interactions with Pharmacology and Medicinal Chemistry to ensure suitability of development candidates. Supervised one M.Sc. level scientist.
- 1989 - 1998 St. Francis Hospital, Wilmington, Delaware – Staff Pharmacist
 Responsible for medication dispensing for a computerized unit dose drug distribution system. Operated parenteral admixture suite.
- 1989 Bryn Mawr Hospital, Bryn Mawr, Pennsylvania – Staff Pharmacist
 Responsible for medication dispensing to critical care neonates from a neonatal intensive care unit satellite pharmacy.
- August 1983 - April 1988 University of Kentucky, College of Pharmacy, Division of Pharmaceutics, Lexington, Kentucky - Graduate Student
 Thesis research project examined the mechanism(s) of diffusion of substituted benzoic acids through ethylene-vinyl acetate copolymers and the application of this technology to a controlled release molluscicide. Instructed graduate students in the use and maintenance of analytical equipment. Instructed undergraduate students in the principles of compounding dosage forms and techniques of patient counseling.
- 1985 - 1988 St. Joseph Hospital, Lexington, Kentucky – Staff Pharmacist
 Responsible for medication dispensing for a computerized unit dose drug distribution system. Operated parenteral admixture suite and a satellite critical care pharmacy. The satellite critical care pharmacy provided immediate pharmacy services to the intensive care unit, cardiac care unit and cardiothoracic unit. Participated as pharmacist to all critical code teams.
- May 1985 - Aug. 1985 DuPont, Medical Products Department, Pharmacy R&D, Wilmington, Delaware
 Summer Intern
 Examined reaction kinetics and solubility behavior of an investigational compound. Presented seminar on the stability, degradation kinetics and solution phenomena of moricizine.
- 1984 - 1985 Begley Drug Store Chain, Lexington, Kentucky – Staff Pharmacist
 Dispensed prescriptions, counseled patients and operated on-line computer system for verifying patient medication records and third-party reimbursement claims.

- April 1979 - Suburban General Hospital, Pittsburgh, Pennsylvania - Pharmacy Intern
 July 1983 Responsible for total parenteral nutrition compounding and medication dispensing for a computerized traditional drug distribution system. Initiated and implemented a return goods program which produced \$13,000 in savings in the first year. Conducted both continuing education programs for nursing and pharmacy staff as well as career outreach program for high school students.
- Sept. 1978 - Hill Medical Center Inc., Pittsburgh, Pennsylvania - Pharmacy Intern
 April 1981 Dispensed prescriptions and operated on-line computer system for verifying patient medication records and third-party reimbursement claims. Handled wholesale drug distribution, including extensive contact with pharmaceutical salesman, detail representatives and retail outlets.

Personally financed college education.

Publications

1. T. J. Smith, M. B. Maurin, S. M. Milosovich, and A. Hussain. Polyvinyl Alcohol Membrane Permeability Characteristics of 5-Fluorouracil. *J. Ocular Pharmacol.* 4: 147-152 (1988).
2. M. B. Maurin, A. Hussain, and L. W. Dittert. Mechanism of Diffusion of Monosubstituted Benzoic Acids through Ethylene-Vinyl Acetate Copolymers. *Prog. Clin. Biol. Res.* 292: 279-282 (1989).
3. M. B. Maurin, G. D. Owoo, and G. Torosian. Solubility and Ionization Behavior of the Antiarrhythmic 4-hydroxy-N-phenyl-3,5-bis(1-pyrrolidinylmethyl)benzamide dihydrochloride (DuP 923). *Pharm. Res.* 7: 1325-1328 (1990).
4. M. Hussain, B. J. Aungst, M. B. Maurin, and L-S. Wu. Injectable Suspensions for Prolonged Release Nalbuphine. *Drug Dev. Ind. Pharm.* 17: 67-76 (1991).
5. M. B. Maurin, A. Hussain, and L. W. Dittert. Dosage Form Design: A Physicochemical Approach. In J. Swarbrick and J. C. Boylan (eds.), *Encyclopedia of Pharmaceutical Technology*, Marcel Dekker, Inc., New York, 1991.
6. M. B. Maurin, A. Hussain, and L. W. Dittert. Thermogravimetric Analysis of Ethylene-Vinyl Acetate Copolymers with Fourier Transform Infrared Analysis of the Pyrolysis Products. *Thermochimica Acta.* 186: 97-102 (1991).
7. M. B. Maurin, A. Hussain, and L. W. Dittert. Mechanism of Diffusion of Monosubstituted Benzoic Acids through Ethylene-Vinyl Acetate Copolymers. *J. Pharm. Sci.* 81:79-84 (1992).
8. M. B. Maurin, R. D. Vickery, W. M. Bryant, III, and M. Hussain. Physicochemical Properties of the Novel Heteropolyanion Antiviral Hexapotassium- α -vanado-11-tungstoborate (DuP 925). *Pharm. Res.* 9:570-574 (1992).

9. M. B. Maurin, R. D. Vickery, P. Ma, J. Manalo, and M. Hussain. Employing Ionization Behaviors to Resolve a Trace-Level Impurity: Determination of 1,4-Dihydro-2,6-dimethyl-4-(3-nitrophenyl)-3,5-pyridinedicarboxylic acid di-2-[methyl-(phenylmethyl)amino]ethyl ester in Nicardipine Drug Substance. *Pharm. Res.* 9:1518-1520 (1992).
10. M. B. Maurin, J. W. C. Pang and M. Hussain. Thermogravimetric Analysis of Ethylene-Vinyl Acetate Copolymer with Dynamic Heating Rates. *Thermochimica Acta.* 209:203-207 (1992).
11. M. Hussain, R. C. DiLuccio, and M. B. Maurin. Complexation of Moricizine with Nicotinamide and Evaluation with Various Complexation Models. *J. Pharm. Sci.* 82:77-79 (1993).
12. M. B. Maurin, W. A. Addicks, S. M. Rowe, and R. Hogan. Physical Chemical Properties of α -Styryl Carbinol Antifungal Agents. *Pharm. Res.* 10:309-312 (1993).
13. M. B. Maurin, R. D. Vickery, C. A. Gerard, and M. Hussain. Solubility and Ionization Behavior of the Antifungal α -(2,4-Difluorophenyl)- α -[(1-(2-(2-pyridyl)phenylethenyl)]-1H-1,2,4-triazole-1-ethanol bismesylate (XD405). *Int. J. Pharm.* 94:11-14 (1993).
14. M. B. Maurin, S. M. Rowe, C. A. Koval, and M. Hussain. Solubilization of Nicardipine Hydrochloride via Complexation and Salt Formation. *J. Pharm. Sci.* 83:1418-1420 (1994).
15. M. Hussain, L. Mersinger, M. B. Maurin, and C. Kettner. *In Situ* Characterization of Nasal Leucine Enkephalin Degrading Aminopeptidase. Susceptibility of the Nasal Enzyme to Boronic Acids and Phosphorous-Containing Peptide and Amino Acid Isosteres. *Int. J. Pharm.* 117:181-188 (1995).
16. M. B. Maurin, R. D. Vickery, and M. Hussain. Elemental Metal Catalysis of the Reduction of the Novel Heteropolyanion Antiviral Hexapotassium- α -vanado-11-tungstoborate (DuP 925). *Drug Stability* 1:50-53 (1995).
17. M. B. Maurin and M. Hussain. A Novel Isolation Method of a Stable Crystalline Salt of a Cyclic RGD Peptide Zwitterion. *Pharm. Res.* 12:1810-1812 (1995).
18. M. B. Maurin, S. M. Rowe, S. M. Bahal, K. L. Langhans, and M. Hussain. Degradation Pathways of N'-(2,4-Difluorophenyl)-N-[5-(4,5-diphenyl-1H-imidazol-2-ylthiol)pentyl]-N-heptyl urea (DuP 128) in Aqueous Suspensions and Cosolvent Solutions. *Drug Stability* 1:112-117 (1996).
19. M. B. Maurin, S. M. Rowe, A. Rockwell, C. M. Foris, and M. Hussain. Characterization of the Salts of a Cyclic RGD Peptide. *Pharm. Res.* 13:481-484 (1996).
20. C. N. Hodge, P. Aldrich, L. Bacheler, C-H. Chang, C. J. Eyermann, M. Grubb, D. A. Jackson, P. K. Jadhav, B. Korant, P. Y-S. Lam, M. B. Maurin, J. L. Meek, M. J. Otto, M. M. Rayner, T. R. Sharpe, L. Shum, D. Winslow, and S. Erickson-Viitanen. Improved Cyclic Urea Inhibitors of the HIV Protease: Synthesis, Potency, Resistance Profile, Human Pharmacokinetics and X-ray Crystal Structure of DMP 450. *Chemistry & Biology* 3:301-314 (1996).
21. S. R. Rabel, M. B. Maurin, S. M. Rowe, and M. Hussain. Determination of the pK_a and pH-Solubility Behavior of an Ionizable Cyclic Carbamate, (S)-6-Chloro-4-(cyclopropylethynyl)-1,4-

- dihydro-4-(trifluoromethyl)-2H-3,1-benzoxazin-2-one (DMP 266). *Pharm. Dev. Tech.* 1:91-95 (1996).
22. M. B. Maurin, S. M. Rowe, K. S. Field, R. C. Swintosky, and M. Hussain. Solubility Behavior, Phase Transition and Structure-Based Nucleation Inhibition of Etanidazole in Aqueous Solutions. *Pharm. Res.* 13:1401-1405 (1996).
 23. M. B. Maurin, R. D. Vickery, R. F. Carney, and M. Hussain. Physicochemical Properties of a Nonpeptide Cyclic Urea HIV Protease Inhibitor (DMP 323). *Int. J. Pharm.* 144:99-106 (1996).
 24. D. L. Burcham, M. B. Maurin, E. A. Hausner and S-M. Huang. Improved Oral Bioavailability of the Hypocholesterolemic DMP 565 in Dogs Following Oral Dosing in Oil and Glycol Solutions. *Biopharm. Drug Disp.* 18:737-742 (1997).
 25. S. R. Rabel, M. K. Shinwari, G. A. Nemeth, K. F. Blom and M. B. Maurin. Kinetics and Mechanism of Hydrolysis of 10,10-Bis(2-fluoro-4-pyridinylmethyl)-9(10H)-anthracenone (DMP 543). *Drug Stability* 1:224-230 (1997).
 26. Z. G. Li, R. L. Harlow, C. M. Foris, H. Li, P. Ma, R. D. Vickery, M. B. Maurin and B. H. Toby. Polymorph Determination of GP IIb/IIIa Antagonist, Roxifiban, Using a Combination of Electron Diffraction and Synchrotron X-ray Powder Diffraction Techniques. *J. Pharm. Sci.* 88:297-301 (1999).
 27. R. D. Vickery and M. B. Maurin. Utility of Microcalorimetry in the Characterization of the Browning Reaction. *J. Pharm. Biomed. Anal.* 20:385-388 (1999).
 28. S. R. Rabel, J. A. Jona and M. B. Maurin. Applications of Modulated Differential Scanning Calorimetry in Preformulation Studies. *J. Pharm. Biomed. Anal.* 21:339-345 (1999).
 29. Z. G. Li, L. Liang, R. L. Harlow, C. M. Foris, R. E. Olson, T. M. Sielecki, J. Liu, R. D. Vickery and M. B. Maurin. Crystalline versus Amorphous Content of Lumaxis Analog XP280 Using X-ray and Electron Diffraction Methods. *J. Pharm. Sci.* 89:1237-1242 (2000).
 30. M. B. Maurin and A. Taylor. Variable Heating Rate Thermogravimetric Analysis as a Mechanism to Improve Efficiency and Resolution of the Weight Loss Profiles of Three Model Pharmaceuticals. *J. Pharm. Biomed. Anal.* 23:1065-1071 (2000).
 31. D. Gao and M. B. Maurin. Physical Chemical Stability of Warfarin Sodium. *AAPS PharmSci* 2001; 3 (1) article 3.
 32. S. R. Rabel, M. Patel, S. Sun and M. B. Maurin. Electronic and Resonance Effects on the Ionization of Structural Analogs of Efavirenz. *AAPS PharmSci* 2001; 3 (4) article 28.
 33. M. B. Maurin, A. Hussain and L. W. Dittert. Dosage Form Design: A Physicochemical Approach in J. Swarbrick and J. C. Boylan (eds.), *Encyclopedia of Pharmaceutical Technology*, 2nd edition, Marcel Dekker Inc., New York, 2002.

34. M. B. Maurin, D. J. W. Grant and H. P. Stahl. The Physicochemical Background: Ionic Equilibria Fundamentals. In C. G. Wermuth and H. P. Stahl (eds.), IUPAC Handbook on Pharmaceutical Salts: Properties, Selection and Use, Verlag Helvetica Chimica Acta AG, Zurich, Switzerland, 2002.
35. Z. G. Li, R. L. Harlow, C. M. Foris, H. Li, P. Ma, R. D. Vickery, M. B. Maurin and B. H. Toby. New Applications of Electron Diffraction in the Pharmaceutical Industry: Polymorph Determination by Using a Combination of Electron Diffraction and Synchrotron X-ray Powder Diffraction Techniques. *Microsc. And Microanal.* 8:134-138 (2002).
36. M. B. Maurin, S. M. Rowe, K. Blom and M. E. Pierce. Kinetics and Mechanism of Hydrolysis of Efavirenz. *Pharm. Res.* 19:517-521 (2002).
37. M. B. Maurin, R. D. Vickery, S. R. Rabel, S. M. Rowe, J. G. Everlof, G. A. Nemeth, G. C. Campbell and C. M. Foris. Polymorphism of Roxifiban. *J. Pharm. Sci.* 91:2599-2604 (2002).
38. R. D. Vickery, G. A. Nemeth and M. B. Maurin. Solid-State Carbon NMR Characterization of the Polymorphs of Roxifiban. *J. Pharm. Biomed. Anal.* 30:125-129 (2002).
39. S. R. Rabel Riley, R. D. Vickery, G. A. Nemeth, M. J. Haas, D. J. Kasprzak and M. B. Maurin. Thermal Decomposition of Matrix Metalloproteinase Inhibitors: Evidence of Solid State Dimerization. *J. Pharm. Biomed. Anal.* 54:324-330 (2011).

Patents

1. S. M. Bahal, K. S. Field, and M. B. Maurin. Etanidazole Injectable Solution. United States Patent 5,192,784 issued March 9, 1993.
2. J. A. Pesti, J. M. Fortunak, G. F. Huhn, M. B. Maurin and J. Yin. Crystalline 10,10-bis(2-Fluoro-4-pyridinyl)methyl)-9(10H)-anthracenone and an Improved Process for Preparing the Same. United States Patent 6,214,847 issued April 10, 2001.
3. S. M. Bahal and M. B. Maurin. Oral Liquid Formulations of Benzoxazinones HIV Reverse Transcriptase Inhibitors. United States Patent 6,235,733 issued May 22, 2001.
4. M. B. Maurin, P. Ma, D. Meloni, J. A. Pesti, L. T. Rossano, R. K. Ward, J. Yin, and L-H. Zhang. Crystalline Roxifiban. United States Patent 6,306,886 issued October 23, 2001.
5. L. Radesca, M. B. Maurin, S. R. Rabel and J. R. Moore. Crystalline Forms of Efavirenz. United States Patent 6,673,372 issued January 6, 2004.

Invited Presentations

1. M. B. Maurin. The Utility of Polymeric Membranes in Controlled Drug Delivery. NSF-Sponsored Membrane Science Colloquium, University of Kentucky, Lexington, KY, January, 1989.

2. M. B. Maurin. Continued Pharmaceutical Achievement - The Challenge to Build on a Foundation of Excellence. Rho Chi Initiation Banquet. Creighton University, Omaha, NE, March, 1991.
3. M. B. Maurin. Polymeric Controlled Drug Delivery. Medical College of Virginia, Virginia Commonwealth University, Richmond, VA, April, 1991.
4. M. B. Maurin, S. M. Rowe, and M. Hussain. A Novel Reversible Degradation Pathway for a Cyclic Peptide (DMP 728). Eighth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Orlando, FL, November, 1993.
5. M. B. Maurin. Isolation and Identification of Pharmaceutically Acceptable Crystalline Forms. Division of Medicinal Chemistry and Pharmaceutics, University of Kentucky, Lexington, KY, September, 1994.
6. M. B. Maurin, R. D. Vickery, and M. Hussain. Isolation and Identification of a Stable Salt Form of a Novel HIV-1 Protease Inhibitor (DMP 450). Podium Presentation in Special Session on Accelerated Drug Development through Preformulation Research. Tenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Miami, FL, November, 1995.
7. M. B. Maurin. Formulation Stabilization through Structure-Based Nucleation Inhibition. Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta, Edmonton, Alberta, Canada, February, 1996.
8. M. B. Maurin. Structure-Based Nucleation Inhibition as a Mechanism to Stabilize Formulations. Twenty-Ninth Annual Higuchi Research Seminar, Lake Ozark, MO, March, 1996.
9. M. B. Maurin. Selection of Suitable Form of Lead Candidates for Development. Symposium on Drug Delivery, Preformulation and Formulation. Conference on Pharmaceutical Science and Technology. Fine Particle Society, Chicago, IL, August, 1996.
10. M. B. Maurin. Isolation and Characterization of Acceptable Physical Forms - Accelerating the Pharmaceutical Development Process. Arnold & Marie Schwartz College of Pharmacy, Long Island University, New York, NY, April 1997.
11. M. B. Maurin, S. M. Rowe, and K. F. Blom. Kinetics and Mechanism of Hydrolysis of Efavirenz (DMP 266). Physical Pharmacy/Preformulation/Solid State Pharmaceutics Podium Session. Twelfth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Boston, MA, November, 1997.
12. M. B. Maurin. Strategies to Minimize Drug Substance Requirements in Early Development. Cycle Time Reduction in Pharmaceutical and Analytical Development, Analytical R&D & Pharmaceutical Development Committees Joint Technical Workshop, Pharmaceutical Research and Manufacturers of America, Lake Buena Vista, FL, April 1999.
13. M. B. Maurin. Phase I Formulation Development Strategy at DuPont Pharmaceuticals. Eastern Regional Meeting, American Association of Pharmaceutical Scientists, Parsippany, NJ, June, 1999.

14. M. B. Maurin. Dosage Form Design. Chem 477, Topics in Biochemistry: Drug Development. Lehigh University, June, 1999.
15. M. B. Maurin. Illustrating the Development of *In Vitro In Vivo* Correlations. Bioavailability and Bioequivalence Workshop, Barnett International, Washington, DC, February, 2001.
16. M. B. Maurin. Emerging Pharmaceuticals Strategies for More Efficient Drug Candidate Identification. AAPS 2001 Annual Meeting and Exposition, Denver, CO, October, 2001.
17. M. B. Maurin. Formulation Strategies to Reach Sufficient Toxicokinetic Exposure to Support Desired Clinical Exposure. AAPS 2002 Annual Meeting and Exposition, Toronto, CN, November, 2002.
18. M. B. Maurin. Career Paths and Opportunities for Pharmaceutical Scientists. School of Pharmacy Alumni Research Colloquium, Pittsburgh, PA, February, 2003.
19. M. B. Maurin. Drug Product Development Strategies. Successful Drug Development for the Biotech Industry Conference, San Diego, CA, April, 2003.
20. M. B. Maurin. Drug Product Development and Manufacturing Strategies. Albany College of Pharmacy, Albany, NY, March, 2004.
21. M. B. Maurin. Dosage Form Design – *from NCE Selection through Commercialization*. Albany College of Pharmacy, Albany, NY, April, 2004.
22. M. B. Maurin. Strategies to Minimize Time & API Requirements to Reach & Complete First-in-Human Studies. Schering Plough Research Institute, Kenilworth, NJ, November, 2004.
23. M. B. Maurin. A Tale of Two Formulations: The Suspense of a Suspension and When a Simple Solution is not so Simple. Duquesne University, Pittsburgh, PA, March, 2013.

Presentations

1. T. J. Smith, M. B. Maurin, S. M. Milosovich and A. Hussain. A Membrane-Based Sustained Release Ocular Delivery System for 5-Fluorouracil. Association for Research in Vision and Ophthalmology, Sarasota, FL, May, 1987.
2. M. B. Maurin, A. Hussain and L. W. Dittert. Mechanism of Diffusion of Monosubstituted Benzoic Acids through Ethylene-Vinyl Acetate Copolymers. Effect of Benzoic Acid Substituent on Diffusion and Partition Coefficients. Second National Meeting and Exposition, American Association of Pharmaceutical Scientists, Boston, MA, June, 1987.
3. M. B. Maurin, A. Hussain and L. W. Dittert. Mechanism of Diffusion of Monosubstituted Benzoic Acids through Ethylene-Vinyl Acetate Copolymers. Effect of Vinyl Acetate Content of Copolymer on Diffusion and Partition Coefficients. Japan-United States Congress of Pharmaceutical Sciences, Honolulu, HI, December, 1987.

4. M. B. Maurin, A. Hussain and L. W. Dittert. Mechanism of Diffusion of Monosubstituted Benzoic Acids through Ethylene-Vinyl Acetate Copolymers. Effect of Media Composition on Diffusion and Partition Coefficients. Third National Meeting and Exposition, American Association of Pharmaceutical Scientists, Orlando, FL, October, 1988.
5. M. B. Maurin and G. Torosian. Solubility and Ionization Behavior of DuP 923. Fourth National Meeting and Exposition, American Association of Pharmaceutical Scientists, Atlanta, GA, October, 1989.
6. M. B. Maurin, R. D. Vickery and M. Hussain. Solution Stability of a Novel Heteropolyanion Antiviral Agent, DuP 925. Fifth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Las Vegas, NV, November, 1990.
7. M. B. Maurin, R. D. Vickery, P. Ma, J. Manalo, and M. Hussain. Determination of 1,4-Dihydro-2,6-dimethyl-4-(3-nitrophenyl)-3,5-pyridinedicarboxylic acid di-2-[methyl-phenylmethyl]amino ethyl ester in Nicardipine Drug Substance. Southeastern Regional Meeting of the American Association of Pharmaceutical Scientists, Wilmington, NC, April, 1992.
8. R. D. Vickery, M. B. Maurin, M. Lim, C. A. Kettner, and M. Hussain. Degradation Pathway of a Novel Tripeptide Inhibitor of Thrombin. Eastern Regional Meeting of the American Association of Pharmaceutical Scientists, New Brunswick, NJ, June, 1992.
9. M. Hussain, R. C. DiLuccio, and M. B. Maurin. Complexation of Moricizine with Nicotinamide and Evaluation with Various Complexation Models. Seventh Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, San Antonio, TX, November, 1992.
10. S. M. Rowe, M. B. Maurin, and M. Hussain. Solution Stability of Etanidazole (DuP 435). Eighth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Orlando, FL, November, 1993.
11. M. B. Maurin, S. M. Rowe, K. S. Field, and M. Hussain. Solubility Behavior of Etanidazole (DuP 435). Eighth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Orlando, FL, November, 1993.
12. S. M. Rowe, M. B. Maurin, and M. Hussain. Degradation Pathways of N'-(2,4-Difluorophenyl)-N-[5-(4,5-diphenyl-1H-imidazol-2-ylthiol)pentyl]-N-heptyl urea (DuP 128). Eighth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Orlando, FL, November, 1993.
13. M. B. Maurin, S. M. Rowe, and M. Hussain. Isolation and Characterization of a Stable Crystalline Form of a Cyclic RGD Peptide (DMP 728). Ninth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, San Diego, CA, November, 1994.
14. M. B. Maurin, R. D. Vickery, and M. Hussain. Physicochemical Properties of a Novel HIV Protease Inhibitor (DMP 323). Ninth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, San Diego, CA, November, 1994.

15. S. Erickson-Viitanen, C. N. Hodge, P. E. Aldrich, L. T. Bacheler, C-H. Chang, C. J. Eyermann, M. Grubb, D. A. Jackson, P. K. Jadhav, B. D. Korant, P. Y-S. Lam, M. B. Maurin, J. L. Meek, M. J. Otto, M. M. Rayner, T. R. Sharpe, L. Shum and D. L. Winslow. Cyclic Urea Inhibitors of HIV Protease. American Society for Microbiology, Human Retroviruses and Related Infections, Second National Conference, Washington, D.C., January-February, 1995.
16. M. Lavander, S. R. Rabel, C. A. Gerard, N. Rogers and M. B. Maurin. Pharmaceutical Development of Compound M. Scholarship Awarded Presentation, ACS SEED Program Meeting, American Chemical Society, Chicago, IL, August, 1995.
17. M. B. Maurin, S. M. Rowe, R. D. Vickery, and M. Hussain. Formulation Stabilization through Nucleation Inhibition. Tenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Miami Beach, FL, November, 1995.
18. V. Chavan, S. Rabel, N. Surendran, and M. B. Maurin. Effect of Excipients and Storage Conditions on the Dissolution Performance of Hard Gelatin Capsules. Graduate Seminar Series, University of Maryland, Baltimore, MD, September, 1997.
19. W. T. Morehead, R. K. Lewis, J. D. Buehler, W. D. Fiske, H. J. Pieniaszek, Jr., W. L. Finan, M. A. Hussain, S. M. Rowe, and M. B. Maurin. Effect of Formulation on the Oral Bioavailability of DMP 266 (Efavirenz) in Dogs. Twelfth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Boston, MA, November, 1997.
20. S. R. Rabel, R. D. Vickery, K. F. Blom, G. A. Nemeth, C. Ray, D. Kasprzak, and M. B. Maurin. Characterization of the Thermal Decomposition of Matrix Metalloproteinase Inhibitors. Twelfth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Boston, MA, November, 1997.
21. S. R. Rabel, R. D. Vickery, K. F. Blom, G. Cain, and M. B. Maurin. Kinetics and Mechanism of Degradation of a Novel Glycoprotein IIb/IIIa Receptor Antagonist (DMP 754). Twelfth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Boston, MA, November, 1997.
22. J. A. Pesti, G. F. Huhn, Y. Yin, J. M. Fortunak, Y. Xing, R. A. Earl, and M. B. Maurin. Development of a Synthetic Process for Scalable Preparations of DMP 543, a New Acetylcholine Release Enhancing Agent. 216th American Chemical Society National Meeting, Boston, MA, August, 1998.
23. S. R. Vaithiyalingam, S. R. Rabel and M. B. Maurin. Preparation and Characterization of Self-Emulsifying Formulations. Northeast Louisiana University, Monroe, LA, September, 1998.
24. J. A. Jona, L. G. Fontalbert, S. M. Rowe and M. B. Maurin. Physicochemical Properties of an HIV Protease Inhibitor. Thirteenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, San Francisco, CA, November, 1998.

25. J. A. Pesti, G. F. Huhn, J. Yin, J. M. Fortunak, Y. Xing, R. A. Earl, and M. B. Maurin. Process Development of DMP 543, an Acetylcholine Release Enhancing Agent. Organic Reactions and Processes, Gordon Research Conference, July, 1999.
26. Z. G. Li, R. L. Harlow, C. M. Foris, H. Li, P. Ma, R. D. Vickery, M. B. Maurin, and B. H. Toby. New Applications of Electron Diffraction in the Pharmaceutical Industry: Polymorph Determination of the GP IIb/IIIa Antagonist, Roxifiban, Using a Combination of Electron Diffraction and Synchrotron X-Ray Powder Diffraction Techniques. 1999 Microscopy & Microanalysis Meeting, Portland, OR, August, 1999.
27. Z. G. Li, R. L. Harlow, C. M. Foris, H. Li, P. Ma, R. D. Vickery, M. B. Maurin, and B. H. Toby. New Applications of Electron Diffraction in the Pharmaceutical Industry: Polymorph and Unit Cell Determination of the GP IIb/IIIa Antagonist, Roxifiban, Using a Combination of Electron Diffraction and Synchrotron X-Ray Powder Diffraction Techniques. Pharmaceutical Powder X-Ray Diffraction Symposium, Philadelphia, PA, September, 1999.
28. K. Oates-Lenz, B. J. Aungst, T. Lloyd, J. P. Bulgarelli, J. A. Tweed, and M. B. Maurin. Design and Implementation of an Automated System for Maintaining Caco-2 Cell Cultures and High Throughput Permeability Screening. Fourteenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, New Orleans, LA, November, 1999.
29. S. M. Rowe, L. Fontalbert, S. Rabel, and M. B. Maurin. Physical Chemical Properties of Efavirenz. Fourteenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, New Orleans, LA, November, 1999.
30. M. Xie and M. B. Maurin. Sublimation Characterization of DPC 963 by Thermogravimetric Analysis and Vapor Pressure Estimation. Fourteenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, New Orleans, LA, November, 1999.
31. M. Xie, V. Sharma and M. B. Maurin. Sodium Lauryl Sulfate-Catalyzed Degradation of DPC 083 in Solid State. Fourteenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, New Orleans, LA, November, 1999.
32. J. A. Jona, L. Fontalbert, S. Rowe, M. Orwat, D. Pinto and M. B. Maurin. Salt Selection and Physicochemical Properties of DPC 423. Fifteenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Indianapolis, IN, November, 2000.
33. J. A. Jona, L. Fontalbert, S. Rowe, G. Harris and M. B. Maurin. Physicochemical Properties of Different Salts of an HIV Protease Inhibitor. Fifteenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Indianapolis, IN, November, 2000.
34. S. H. Sun, S. M. Rowe, D. K. Murphy and M. B. Maurin. Relative Thermodynamic Stability of Efavirenz Polymorphs. Fifteenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Indianapolis, IN, November, 2000.

35. S. R. Vaithiyalingam, S. R. Rabel and M. B. Maurin. Preparation and *In Vitro* Characterization of Self-Emulsifying Drug Delivery Systems Containing an Investigational Compound. Fifteenth Annual Meeting and Exposition, American Association of Pharmaceutical Scientists, Indianapolis, IN, November, 2000.
36. Z. G. Li, R. L. Harlow, W. Marshall, C. M. Foris, D. Murphy and M. B. Maurin. Crystal Structure Data for Efavirenz by Combined Synchrotron X-Ray Diffraction and Electron Microscopy Techniques. Microscopy Society of America Meeting, Long Beach, CA, August, 2001.

Mentoring and Teaching

Pharmaceutical Industry Interns

Mentored, instructed and supervised eight summer interns (four graduate students, three undergraduate students, and one high school student). Each of the eight completed a research project and presented their findings in poster format at a corporate internal poster symposium. Four projects resulted in peer-reviewed publications and four projects resulted in external presentations. The four graduate students have all completed graduate degrees. The three undergraduate students completed their degrees and two entered graduate school. The high school student received an award and travel fellowship from the SEED (Science Education for the Economically Disadvantaged) program to present the results of her internship at an ACS meeting.

University of Maryland, School of Pharmacy, Baltimore, Maryland

Adjunct Assistant Professor, 2001- 2010

Doctoral Committee Member for Varsha Chavan, 1998 – 2001; Dissertation Reader

(Dissertation entitled Effect of Simulated Inspiratory Flow Rate, Rate of Rise in Flow Rate and Inhaled Volume on the Performance of Dry Powder Inhalers.)

Coordinated, presented and hosted day-long symposia for pharmaceuticals graduate students in which students were exposed to the pharmaceutical industry (1999 and 2001)

Delaware Science Alliance

Fostered interest in science and mathematics among elementary and high school students in Delaware. Presented at various schools with a focus on applications of what the students were learning in a given class to actual pharmacy or research problems. Sponsored and judged various science and innovation fairs. Founding Member, 1988-2002

Professional Activities

American Pharmacist Association

Academy of Pharmaceutical Sciences Member, 1984-present
Journal of Pharmaceutical Sciences, Editorial Advisory Board Member, 2002-present and
Reviewer, 1989-present.
Recognized for editorial excellence in 2003, 2004, 2005, 2014 and 2025.
Appointed to Editor in Chief Search Committee, 2020.
Professional Member, 1983-present
Student Member, 1979-1983

American Association of Pharmaceutical Scientists

Member of the Preformulation & Formulation Design/Development, Oral Biopharmaceutics and
Absorption Modeling, Manufacturing Science and Engineering, and Outsourcing Communities
(formerly Formulation Design and Development, Physical Pharmacy and Biopharmaceutics, &
Analysis and Pharmaceutical Quality Sections), 1985-2022
Reviewer for Pharmaceutical Research and Journal of Pharmaceutical and Biomedical Analysis,
1989-present; Pharmaceutical Development and Technology, 1997- present and AAPS Open,
2017-present
Reviewer for Abstracts to the AAPS Annual Meeting, 1989-2001; PDD Section Abstract
Screening Committee Member, 1998 and 2000; PDD Section Abstract Screening
Committee Chair, 1999
Visiting Scientist Program, 1990-2002
The AAPS Journal, Editorial Advisory Board Member, 1999-2005

Product Quality Research Institute

Biopharmaceutics Technical Committee, Oral Biopharmaceutics of Immediate Release Products
Working Group Member, 2000-2002

National Institutes of Health, National Cancer Institute

Expert Panel Reviewer for RFP "Development of Dosage Forms and Delivery Systems for
Antitumor Agents", 2002

International Union of Pure and Applied Chemistry (IUPAC)

Division of Chemistry and Human Health, Medicinal Chemistry Section, Delegate to the
Pharmaceutical Salt Selection Working Party 1998-2001

Drug Stability

Editor for America, 1995-1999

Michael B. Maurin, R.Ph., Ph.D.
 Deposition and Trial Testimony
 November 2021 to November 2025

#	Case Number District Deposition/Trial Date	Parties	Retained as an Expert by
1	Civil Action No. 2:21-cv-10057 (MCA) (MAH) New Jersey Deposition: June 28, 2024	BAUSCH HEALTH IRELAND LTD., et al., Plaintiffs, v. MSN PHARMACEUTICALS INC., et al., Defendants	MSN PHARMACEUTICALS
2	Civil Action No. 2:21-cv-10057 (MCA) (MAH) New Jersey Trial date: November 12, 2025	BAUSCH HEALTH IRELAND LTD., et al., Plaintiffs, v. MSN PHARMACEUTICALS INC., et al., Defendants	MSN PHARMACEUTICALS