

PROMOTION RECOMMENDATION

The University of Michigan
College of Pharmacy

Nair Rodríguez-Hornedo, associate professor of pharmaceutical sciences, with tenure, Department of Pharmaceutical Sciences, College of Pharmacy, is recommended for promotion to professor of pharmaceutical sciences, with tenure, Department of Pharmaceutical Sciences, College of Pharmacy.

Academic Degrees:

PhD 1984 University of Wisconsin, Madison, WI
MS 1977 University of Wisconsin, Madison, WI
BS 1975 University of Puerto Rico, Rio Piedras, PR

Professional Record:

1994-present Associate Professor of Pharmaceutical Sciences (with tenure), College of Pharmacy, University of Michigan
1989-1994 Assistant Professor of Pharmaceutical Sciences (without tenure), College of Pharmacy, University of Michigan
1985-1989 Assistant Professor (without tenure), College of Pharmacy, University of Arizona
1984-1985 Research Scientist, Pharmaceutical Research and Development, American Cyanamid, Pearl River, NY

Summary of Evaluation:

Research: Professor Rodríguez-Hornedo is a world-renowned pioneer and leader in the field of pharmaceutical cocrystals. Her research program has addressed the fundamentals of drug crystallization and the molecular level processes that control nucleation and crystal growth from solution, and during dissolution, of more soluble solid-state forms of drugs. More recently, her research has focused on quantitative, mechanistic-based approaches to pharmaceutical cocrystal engineering and supramolecular chemistry, which has very important implications for improving drug solubility, stability and bioperformance. Since her promotion to associate professor, Professor Rodríguez-Hornedo has published 46 peer-reviewed articles in top-rated pharmaceutical journals (and five book chapters). Her writings have had significant impact in the field with 13 having been cited over 50 times, six over 100 times, and three over 200 times. The significant impact of her work is further demonstrated by the numerous invited presentations she has given nationally and internationally, and she was awarded the prestigious Ebert Prize by the American Pharmacists Association (APhA) Academy of Pharmaceutical Research and Science in 2004.

Significant Publications:

Lipert MP, Rodríguez-Hornedo N. Cocrystal transition points: Role of cocrystal solubility, drug solubility and solubilizing agents. *Mol Pharm* 12:3535-3546, 2015 (IF 4.961).
Huang N, Rodríguez-Hornedo N. Engineering cocrystal thermodynamic stability and eutectic points by micellar solubilization and ionization. *CrystEngComm* 13:5409- 5422, 2011 (IF: 4.022).
Bethune SJ, Huang N, Jayasankar A, Rodríguez-Hornedo N. Understanding and predicting the effect of cocrystal components and pH on cocrystal solubility. *Crystal Growth Des* 9:3976-3988, 2009 (IF: 4.759).
Jayasankar A, Reddy LS, Bethune SJ, Rodríguez-Hornedo N. Role of cocrystal and solution chemistry on the formation and stability of cocrystals with different stoichiometry. *Crystal Growth Des* 9:889-897, 2009 (IF: 4.759).

Jayasankar A, Good DJ, Rodríguez-Hornedo N. Mechanisms by which moisture generates cocrystals. *Mol Pharm* 4:360-372, 2007 (IF: 4.961).

Teaching: Professor Rodríguez-Hornedo is a very dedicated and highly valued educator. She provides didactic teaching to professional pharmacy students, as well as graduate students, and has mentored several graduate students and post-doctoral trainees in her laboratory. The majority of her student ratings range between 4 and 5 on a 5-point scale and are above the college's average. Professor Rodríguez-Hornedo challenges students to not only learn the material, but to think critically; solve problems; assimilate facts and concepts in order to relate physicochemical behavior to dosage form design and drug delivery; and to transfer principles and understanding to new settings. Since her promotion to associate professor, she has mentored 24 PhD students and eight post-doctoral, MS, PharmD and BS students. Professor Rodríguez-Hornedo was co-founder and co-director of the Interdisciplinary Graduate Program in Pharmaceutical Engineering. She was also a critical member of several committees in creating a new PharmD curriculum, as well as new curricula for the BS in Pharmaceutical Sciences and MS Pharmaceutical Engineering programs.

Service: Professor Rodríguez-Hornedo is a solid citizen of her profession and the university. She has served as the chair of the Pharmaceutical Sciences Graduate Program since 2013 and is a member of several college and university committees. She has served on numerous graduate student dissertation committees in the Departments of Pharmaceutical Sciences and Chemistry. She is currently an editor or on the editorial advisory board of three scientific journals, is a reviewer for over 15 journals, and has served the NSF as an ad hoc reviewer for about 10 years. She is dedicated to diversity, having been involved in NIH Bridges to Doctoral Degree program and having a significant impact in advancing science to underrepresented minorities in the United States, as well as teaching short courses in Puerto Rico, Mexico, Honduras, Brazil, India, China, and Europe.

External Reviewers:

Reviewer A: "Her work...has been groundbreaking...when one wants to determine the state-of-the-art in fundamental understanding of physicochemical properties of solid-state formulations, her name is close to the top of any list of experts...her mentorship has an impact on the field far beyond her own direct work."

Reviewer B: "...she has also adopted an innovative teaching style....Dr. Rodríguez has established herself as one of the leaders in the world on crystallization, nucleation, crystal growth and related fields....Her papers ...were groundbreaking....Dr. Rodríguez is a truly innovative thinker...."

Reviewer C: "...the candidate has excelled and made her mark as an international leader.... always 'one step ahead' of her peer group in anticipating issues surrounding cocrystal research and publishing relevant papers to address new challenges that other experts in the field have possibly not even considered."

Reviewer D: "This subject has major implications in the area of pharmaceutical sciences....In the US I would count perhaps ten or so as being considered internationally outstanding in terms of novel and informative work in this area....I would certainly count Nair amongst this group."

Reviewer E: "...Prof. Rodriguez-Hornedo has become one of a few pioneers....because of her vision and contribution, cocrystal formulation has been brought to the pharmaceutical industry as a viable option for delivering poorly soluble drugs....She is a world leader in organic solid-state chemistry."

Reviewer F: “Nair has done pioneering work on the basic principles that dictate cocrystal solubilization, dissolution and absorption....Nair’s work on cocrystals is very well known in the international crystal engineering and pharmaceutical crystallization communities, is highly cited....”

Reviewer G: “She is an internationally recognized scientist who is one of the leading experts in the synthesis and characterization of co-crystals.... This information is critical for the further application of co-crystals, and is the primary information that a pharmaceutical company would need to apply this technology....her being *the only researcher to fully explore the thermodynamic relationships in co-crystals*, and therefore being the world’s leading expert in a field of great interest to the pharmaceutical industry.”

Reviewer H: “Her scientific research and teaching accomplishments and international activities through invited lectures and teaching...clearly indicate that Dr. Rodríguez-Hornedo deserves to be a Professor.”


Reviewer I: “...she...is generally acknowledged as the primary expert in the general field of ‘crystallization of pharmaceuticals,’ which is a field of considerable importance....Her work...has been particularly outstanding, and it seems clear that she is one of the leaders, if not ‘the leader’ in this field.”

Reviewer J:

“...the community pays close attention as her findings are oftentimes monumental....I would consider Nair to be *the* definitive authority on drug delivery through co-crystallization.”

Reviewer K: “...she has been well recognized internationally by both academics and the pharmaceutical industry as a pioneer in the field of pharmaceutical cocrystals....The July 2015 approval of Entresto[®], a Novartis drug product that is enabled by a cocrystal, is the first example of the full development of a pharmaceutical cocrystal and it is likely to be followed by many more in the next 5-10 years given that Entresto[®] is being touted as a blockbuster drug product.... Dr. Naír Rodríguez-Hornedo is clearly recognized as the leading figure in terms of understanding the complex physical chemistry of cocrystallization.”

Summary of Recommendation: Professor Rodríguez-Hornedo is a world-renowned leader in the area of pharmaceutical cocrystals, whose work has had a significant impact. She is a very dedicated teacher and mentor and is a solid citizen of her professional and university. It is with the support of the College of Pharmacy Executive Committee that I recommend Naír Rodríguez-Hornedo for promotion to professor of pharmaceutical sciences, with tenure, Department of Pharmaceutical Sciences, College of Pharmacy.


James T. Dalton
Dean, College of Pharmacy

May 2016