May 15, 2017 - The Purdue College of Pharmacy is pleased to highlight Dr. Qi (Tony) Zhou, Assistant Professor of Industrial and Physical Pharmacy, whose research focuses on pharmaceutical manufacturing and pulmonary drug delivery. Dr. Zhou received his BEng in Pharmaceutics from Shenyang Pharmaceutical University of China and his MS from the National University of Singapore. He then completed his PhD in Pharmaceutics at Monash University of Australia and a postdoctoral fellowship at the University of Sydney. He joined the Purdue faculty in 2015 as Assistant Professor of Industrial and Physical Pharmacy. He is an Editorial Board Member of Journal of Pharmaceutical Sciences and has been awarded many early-career prizes including the AAPS Postdoctoral Fellow, Australian Endeavour Fellowship, Australian Early Career Fellowship (equivalent to NIH K01), and IPEC Emerging Researcher Award.

What first interested you in your chosen research field? Honestly, I started my research in inhalation formulation without any choice—this project was assigned to me by my master study supervisor. I totally had no idea what was inhalation therapy 13 years ago (this is an awkward answer). I did not say “NO” to that project because after I had done some quick searching in this area, I found it is really an interesting and important field. Pollution has caused a rapid increase in pulmonary diseases such as asthma, chronic obstructive pulmonary diseases, and lung cancers in developing countries such as my hometown, China. Inhalation therapies become more and more important as effective local treatments for these pulmonary diseases. These make me stay in this field for the past 13 years.

Briefly, please describe your research. My research focuses on developing new inhalation therapies...
by emerging formulation technologies such as particle engineering. Current traditional formulations of dry powder inhaler products have very low delivery efficiency. For example, only less than 20-40% of the drug dose can be delivered to the target sites in the lower airways. My research has applied novel technologies (e.g. spray drying or surface coating) to improve the delivery efficiency to up to 80%, aiming to reduce the product cost and the side effects. These new formulation technologies can be employed to both small molecules and biologics, and I believe they are promising to paradigm-shift the future of pharmaceutical manufacturing.

Describe the current work you are doing in your lab and what you hope to accomplish? One of the project in my lab is to develop safer and more efficacious inhalation therapies of antibiotics for better treatment of deadly Gram-negative lung infections. Lung infections are the fourth leading cause of death globally, and those caused by multi-resistant Gram-negative pathogens are very dangerous and particularly difficult to treat. Colistin is often the only option, but the parenteral therapy has very limited efficacy in the treatment of lung infections due to limited drug exposure at the infection sites. Simply increasing the dose of parenteral colistin is not feasible because of the dose-limiting nephrotoxicity. Nebulized colistin has been used in the clinic for the treatment of lung infections in an attempt to circumvent the limitations of the parenteral route; however, the current inhaled colistin therapies have very poor delivery efficiency (typically <40% of drug is delivered to the lungs) and, thus, exhibit compromised efficacy and significant pulmonary adverse effects (e.g. cough and throat irritation). Thereby, there is an urgent need to develop optimized inhalation therapies of colistin, as it maximizes the bacterial killing, minimizes the colistin resistance, and avoids the dose-limiting systemic toxicity.

What do you enjoy most about working in the College and with the students? Purdue Pharmacy has a wonderful collaborative climate. People here are nice and keen to work together as a team, making me feel like being in a big family. The students, particularly graduate students, are outstanding with very diverse backgrounds ranging from biological science and pharmacy to engineering. In many cases, you can get new ideas from the students based on their biological- or engineering-type of thinking, which is beyond the scope of pharmacist-type of thinking. I do enjoy working with them!
IMAGE 2: Novel particle engineering techniques can manipulate particle properties and produce ‘smart’ particles with superior drug delivery efficiency for inhalation therapies.