

In Conversation with Sarah Zellnitz-Neugebauer

Dr. Sarah Zellnitz-Neugebauer is senior scientist at Area II “Advanced Formulations” at the Research Center Pharmaceutical Engineering (RCPE) in Graz (AT), where she is leading the Inhalation group and coordinating the different activities in this field.



What initially drew you toward a career in science, and was there a particular turning point that solidified your decision?

Sarah: I have always been fascinated by the possibility of translating scientific discoveries into tangible benefits for patients. From early on, I was drawn to pharmacy—the knowledge of medications and their mechanisms, and the power they hold to relieve symptoms and treat disease. During my academic training, I became particularly interested in drug delivery and the challenge of improving treatment outcomes for chronic and infectious diseases.

My motivation was further strengthened by my personal background: my father lives with a chronic infectious disease, which has made me very aware of the limitations of existing therapies and the importance of better treatment strategies. A key turning point was realizing how formulation and delivery strategies can significantly impact the effectiveness of therapies, especially in diseases such as tuberculosis, where long-term administration of multiple antibiotics often leads to poor patient adherence, side effects, and the development of antibiotic resistance. The opportunity to contribute to innovative drug delivery approaches that address these challenges ultimately solidified my decision to pursue a career in pharmaceutical research and development.

What were relevant turning points or decisions along your career so far?

Sarah: Several key decisions have shaped my career so far. After completing my pharmacy studies and the subsequent working year in a public pharmacy (“Aspirantenjahr”), I realized that simply working within the existing framework of medications and therapies was not enough for me. I wanted to contribute more actively to innovation and was convinced that there was greater potential in advancing how medicines are developed and delivered.

Driven by my fascination with translating scientific discoveries into tangible benefits for patients, I decided to pursue a PhD in Pharmaceutical Engineering at the Technical University. This step allowed me to deepen my understanding of formulation science and drug delivery technologies and marked a clear turning point from primarily applying existing knowledge to actively generating new solutions for improving patient care.



Who and what influenced or supported your early career choices the most?

Sarah: My family provided continuous encouragement and support throughout my education and early career, even though, coming from a family of teachers with little background in science. Equally important was the opportunity to work in a research institute early on, where I was exposed to an inspiring scientific environment, excellent mentors, and a highly supportive PhD supervisor, whose guidance as a female role model was particularly influential in shaping my development as an independent scientist. In addition, competitive funding programs and collaborative research initiatives, such as the DFG Priority Programme and the Hertha Firnberg Programme, played a crucial role in enabling key research projects and career milestones. These experiences and support networks significantly influenced my professional development and helped me establish an independent research profile.

I would encourage women to pursue science with confidence and curiosity

What is your most impactful scientific achievement, and what is its primary social value?

Sarah: One of my most impactful scientific achievements has been building my independent research profile in inhalation-based drug delivery for infectious lung diseases, particularly tuberculosis. A key milestone was definitely the FWF Hertha Firnberg grant, which enabled excellent research in pulmonary antibiotic delivery and the development of novel strategies to improve treatment efficacy. Another important step was the Galenus Technology Prize which I was granted for my work on “Surface-modified drug carriers for inhalation therapy - Co-processing and formation of crystalline coatings” and my leading role in the Galenus Workshop on *Recent Developments in Particle Engineering*, which strengthened my scientific exchange, leadership skills, and interdisciplinary network and most of all: expanding the impact of my research.

The primary social value of my work lies in improving treatment outcomes for tuberculosis by addressing challenges such as long treatment duration, poor adherence, and antibiotic resistance through more effective and patient-friendly drug delivery systems.

What are some of the most significant challenges or barriers you've encountered in your work, and what strategies did you use to overcome them?

Sarah: A major challenge in pharmaceutical research is translating promising laboratory findings, especially innovative and new particle engineering techniques into clinically relevant solutions. Developing inhalation therapies requires the integration of expertise from multiple disciplines, including formulation science, material science, particle engineering, aerosol technology, microbiology, and clinical research. Navigating this complexity often involves technical setbacks and long development timelines. I have addressed these challenges by fostering interdisciplinary collaborations, maintaining a strong focus on the clinical relevance of my research, and viewing setbacks as opportunities to refine scientific questions and experimental approaches. What helped most was persistence and a lot of teamwork.

Have you experienced any benefits or challenges as a woman in science, and how have you dealt with them?

Sarah: Throughout my career, I have been fortunate to receive support from excellent mentors, colleagues, and funding programs that actively promote the advancement of women in science. My own path, from pharmacy studies and my “Aspirantenjahr” to pursuing a PhD in Pharmaceutical Engineering was strongly encouraged by mentors and, in particular, by my female PhD supervisor, who served as an important role model and demonstrated that a successful scientific career and personal commitments can be combined.

At the same time, women in academia can still face challenges, including underrepresentation in leadership positions and the need to balance career progression with personal and family responsibilities. I believe that strong professional networks, mentorship, and institutional support are crucial in addressing these challenges. For me, seeking collaborative environments and taking advantage of dedicated career-development programs have been valuable strategies for navigating these hurdles and building a successful scientific career.



Sarah Zellnitz-Neugebauer.