Brazilian Journal of Analytical Chemistry
2022, Volume 9, Issue 37, pp 3–7
doi: 10.30744/brjac.2179-3425.interview.srath

INTERVIEW

Professor Susanne Rath, a researcher who has bravely faced challenges since childhood, kindly granted BrJAC an interview

Susanne Rath

Susanne Rath is an associate professor in the Institute of Chemistry at the University of Campinas (Unicamp), where she coordinates the "*Laboratório de Bioanalítica Paracelsus*". She graduated with a Bachelor's degree in Chemistry (1983) from the University of Brasília (UnB), a Master's degree in Chemistry (1986) from Unicamp, and a Ph.D in Pharmaceutical Chemistry (1990) from the Johann Wolfgang Goethe Universität Frankfurt am Main, Germany. So far, she has published 110 articles and seven book chapters, had four patents granted, and she has presented over 230 papers at scientific conferences. She supervised 17 master's students, 20 doctorate students and 10 post-docs. In addition, she coordinated 23 research projects supported by Brazilian funding agencies.

Prof. Dr. Rath's primary research is focused on toxic compounds in food, residue depletion studies of veterinary drugs in food-producing animals, development and validation of analytical methods, application of bidimensional chromatography and mass spectrometry, environmental impact assessment of veterinary drugs, antimicrobial resistance and N-nitrosamines in food, cosmetics and drugs.

Since 2007, Prof. Rath has been a member of the Joint Expert Committee on Food Additives (JECFA) of the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO). Since 2011, Prof. Rath has been a member of the Technical Group on Maximum Residue Limits for Veterinary Drugs in Food of the National Health Surveillance Agency (Anvisa) of the Ministry of Health of Brazil.

How was your childhood?

I was born in Munich, Germany, and my parents migrated to Brazil when I was only seven years old. My childhood was full of challenges and adventures. The first was to learn the Portuguese language and adapt to the new customs in the south of Brazil. Rio Grande do Sul was the place of my first Brazilian home but not the last. Many moves between different cities happened over the years, and, briefly, I can say that I had a nomadic childhood. Over the years, I fell in love with Brazilian culture and decided to build my life in this country.

Cite: Rath, S. Professor Susanne Rath, a researcher who has bravely faced challenges since childhood, kindly granted BrJAC an interview**.** *Braz. J. Anal. Chem.,* 2022, *9* (37), pp 3-7. http://dx.doi.org/10.30744/brjac.2179-3425.interview.srath

What early influences encouraged you to study chemistry? Did you have any influencers, such as a teacher?

I don't remember having in my live a specific event or person who guided or encouraged me to pursue a career in Chemistry. My scientific curiosity, my love for reading, and the pleasant feeling of learning new things always motivated me. Early on, I realized that my vocation was directed to science. Chemistry, Biochemistry, or Pharmacy would have been my primary choices, but it was Chemistry that I decided to study at the University of Brasilia.

When did you decide to go into the field of chemistry? What motivated you? How was the beginning of your career in chemistry?

In the first years of my undergraduate degree in Chemistry, I was sure I would follow an academic career. I was motivated by my passion for research and admiration for lecturing. After graduation, I decided to do a master's in Analytical Chemistry at the University of Campinas (Unicamp). I developed work in electrochemistry, which proved to be an exciting challenge. However, to reach my goal of becoming a professor, I required further specialization. I had the opportunity to do a Ph.D. in pharmacy, biochemistry, and food science at the Johann Wolfgang Universität in Frankfurt, Germany. The return to my home country reaffirmed my roots and allowed me to study pharmaceutical chemistry. I had great master's and many opportunities in Germany, but I was determined to return to Brazil.

My academic and teaching life began at the University of Brasília, first as a visiting professor and then as an associate professor. Driven by personal choices and searching for new challenges, I decided to leave Brasília and pursue a career in the Institute of Chemistry at Unicamp.

What has changed in the students' profile, ambitions, and performance since the time you started your career?

The student profile has changed over the years, and it has been a constant challenge to keep up with these transformations. In general, students have enormous ease in using technology for learning, but at the same time, they are more impatient, which seems to reflect in their scientific curiosity. They are questioning less, and they have more difficulty in defining the paths they would like to follow in their education and professional lives.

Could you comment briefly on the recent evolution of analytical chemistry, considering your contributions?

Analytical chemistry, as well as science in general, has evolved impressively with the advancement of technology and instrumentation. Today, the challenges are very different from those I faced at the beginning of my career. Having a research group at Unicamp is and has been a great privilege both because of the excellent infrastructure available and the ease of scientific cooperation with colleagues from the most diverse areas.

Indeed, my most significant contribution is not only focused on Analytical Chemistry but also in the areas of food toxicology and environmental chemistry. I can highlight my work in the area of food safety. It is more specifically focused on the residues of veterinary drugs in food. For over a decade, I have actively participated in the Joint FAO/WHO Expert Committee on Food Additives (JECFA) on risk assessments and, in particular, in the establishment of maximum residue limits for veterinary drugs in food, which were subsequently adopted by the Codex Alimentarius and by the governmental agencies of the member countries, which includes Brazil. This experience of interacting with our governmental agencies, such as the National Health Surveillance Agency (ANVISA) and the Ministry of Agriculture, Livestock, and Supply (MAPA), as well as other international agencies, and with the pharmaceutical industry has allowed me to share knowledge and experiences.

What are your lines of research? You have published many scientific papers. Would you highlight any?

My research areas have followed my nomadic profile. I started in organic electrochemistry, and today I am developing research in food toxicology, pharmacy, and environmental chemistry. My research group has been working on developing analytical methods by using different separation techniques, emphasizing two-dimensional chromatography associated with mass spectrometry. This research aims to determine compounds with toxic potential in foods, drugs, and environmental matrices at ppb and ppt levels. In recent years, our group's main research has focused on veterinary drugs, including studies on the mobility of veterinary drugs in the environment and on the depletion of veterinary drugs in food-producing animals. Also, the emergence of bacterial resistance resulting from the use of antimicrobials in aquaculture has been addressed. Finally, we have focused on determining N-nitrosamines in personal care products, cosmetics, and medicines to understand where contamination by these compounds, considered a "group of concern", occurs in the process. With the knowledge acquired over the years, our laboratory has collaborated to find solutions to these problems.

Most of the results developed with the collaboration of students and researchers over the 25 years have been published or presented in scientific events. I had the great privilege of having students in our group who graduated in different areas of knowledge: it is always an enriching experience for everyone. Within the most recent work we developed, I would highlight one that came from a cooperative project with the research group of Professor Michael Schloter from the Helmholtz Zentrum in Munich. This work aimed to evaluate the emergence of resistant bacteria resulting from using antimicrobials in aquaculture. This cooperation extended into a new challenge: discussing the use of veterinary drugs from the "One Health" perspective. Now, this project involves researchers from five countries and received funding from the European Community Horizon 2020.

Good moments in the laboratory with students (Caio, Rafael, Alyne, Gabriela, Natalia and Andreza).

What is your opinion about the current progress of chemistry research in Brazil? What are the recent advances and challenges in scientific research in Brazil?

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Due to the cuts in funds allocated to research, we are experiencing a delicate and challenging moment in Brazil. This scenario requires great effort from researchers to maintain their research activities. Research in Brazil is closely associated with postgraduate education, so I understand that it is also crucial to discuss the situation of postgraduate scholarships. It is impossible to turn a blind eye to the financial difficulties that our postgraduate students are currently experiencing. Staying in large cities, such as Campinas-SP Brazil, to develop their thesis with exclusive dedication has been quite tricky. Training qualified human resources are one of our most important missions and our most significant contribution to society and should be prioritized by our public policies.

For you, what have been the most important recent achievements in analytical chemistry research? What are the landmarks? What has changed in this scenario with the COVID 19 pandemic?

The pandemic has imposed many changes in our day-to-day life. A situation that seemed to be temporary and controlled now extends over a long period of time. We have spent two years with many challenges that have required dedication in learning how to use technology to our favor, both in teaching classes and in discussing research projects, in an environment that was not always ideal. The pandemic years have been a period of understanding one another and ourselves.

I think that the greatest scientific advances that took place in this period were in the area of healthcare, the highest point being the surprisingly rapid development of vaccines. Scientists from different fields around the world have been researching with a common goal, which is the quintessential environment for any breakthrough research.

In Analytical Chemistry, I would point out to the ohmic sciences as a major milestone. Currently, the biggest challenge is not to develop an analytical method but to extract information from a large set of complex data that can be obtained with enormous speed, which can only be done by using cutting-edge technologies (i.e., big data).

What is the importance of awards for the development of science and new technologies?

There is a difference between receiving recognition and receiving awards. There seems to be a reversal of values in this regard. “Awards” ended up being part of one of the items in a researcher`s *curriculum*, and it lost its prominence, its real purpose. The development of science does not depend on awards. Scientists dedicate their lives to science because they breathe scientific curiosity, not because they expect to be recognized. As Albert Einstein once said – “the greater the knowledge, the smaller the ego”.

For you, what is the importance of the national funding agencies for the scientific development of Brazil?

Funding agencies are essential for the scientific development of any country. History clearly showed us this as a fact. Highly developed countries have invested and still invest in science. Brazilian funding agencies are the foundation for developing research and training qualified human resources in the country.

At the moment, the situation for scientific research in Brazil is one of decreasing investment. How do you see this situation, and what would you say to young researchers?

The reduction of investments in research is a great setback for the development of Brazil. Unfortunately, our public policies have not had this perception, and the universities and research centers have suffered directly and continuously from funding cuts that impact scientific production.

To the young researchers, I would say not to give up and use their creativity to find alternatives for financing for their research. I have experienced, although modestly, the investment of some industries

in research projects. The interaction between the private sector and the academy benefits everyone and contributes to the country's development. We need to look for alternatives.

There are in Brazil, and around the world, several conferences on Chemistry. To you, how important are these meetings to the chemistry scientific community? How do you see the development of national chemistry meetings in Brazil?

Scientific meetings are particularly useful if there is an in-depth scientific discussion on relevant topics relevant to the development of science. I specifically remember attending an international event where representatives from academia, government, and industry were present. It was a small event but certainly, the most interesting one that I had the opportunity to attend. National meetings have greatly increased the number of participants, which, in my opinion, limits more in-depth discussions on specific topics. However, it is a valuable opportunity for students to present their scientific work, meet other research groups, and establish interactions for possible future collaborations.

Consultant's Meeting at the International Atomic Energy Agency in Vienna, 2019, discussing "Food safety and radiometric analysis".

What advice would you give to a young scientist who wants to pursue a career in chemistry?

Chemistry is simply fascinating! I would even say, immerse yourself in Chemistry, explore associated areas, expand your knowledge, and never get complacent. Run after your dreams, and when one challenge is overcome, look for new ones. Be creative and persistent and use all of your knowledge to ensure a sustainable and better world for the future generations.

For what would you like to be remembered?

For having had the privilege of sharing the little that I know.