Professor Alice A. da Matta Chasin, who has extensive experience in Toxicology, with emphasis on Forensic Toxicological Analysis, recently gave an interview to BrJAC

Alice Aparecida da Matta Chasin

Full Professor of Toxicology at the Faculty of Pharmacy and Biochemistry, Oswaldo Cruz, São Paulo, SP, Brazil
alice.chasin@oswaldocruz.br

Dr. Alice Aparecida Chasin held the position of Criminal Toxicologist of the Forensic Toxicology Nucleus of the Legal Medical Institute of São Paulo from 1976 to 2004. She was president of the Brazilian Society of Toxicology (SBTox) in the biennium 2004-2005. She has experience in toxicology with emphasis on toxicological analysis that applies mainly to the following subjects: drugs of abuse, crack, cocaine, cocaethylene, toxicology, ecotoxicology, toxicology forensics, and in the area of toxicology education. She also participated in research projects on drugs of abuse coordinated by the National Institute on Drug Abuse (NIDA). She was the representative of The International Association of Forensic Toxicologists (TIAFT) in Brazil during the period from 1995 to 2018. TIAFT is an association that aims to promote cooperation and coordination of efforts among members of this organization and to encourage research in forensic toxicology.

Her academic background includes a degree in Pharmacy and Biochemistry from the São Paulo State University - UNESP (1975), a master's degree in Toxicology and Toxicology Analysis from the University of São Paulo - USP (1990) and a Ph.D. in Toxicology from the University of São Paulo – USP (1997). She has a Specialization in Drug Analysis conferred by WHO (World Health Organization - Narcotics Division) in 1994. During this period, she received scholarships to further her knowledge abroad in Salt Lake City, USA and in Buenos Aires, Argentina.

When was your first contact with the toxicology area? Did you have any influencer, for example, a teacher?

My first contact with toxicology was in college, during the undergraduate course of Pharmacy and Biochemistry. The professor of toxicology was great and motivated the students. But I also liked other disciplines a lot. Shortly before my graduation, a call for tenders was published to select forensic toxicologist experts for the Medico-Legal Institute of São Paulo (IML-SP). When I was recently graduated, I entered the contest, was approved, and started working as an expert in the so-called Forensic Toxicology Technical Service of the IML-SP.

How was the beginning of your career? How do you see the progress of women in science?

Early in my career I fell in love with my job. Being able to speak for those who could no longer do so awakened me to the importance of forensic science and being able to participate in the development of forensic toxicology was extremely gratifying.

I see with great satisfaction the progress of women in science. We are many and we are strong (laughs). In Brazil, toxicology research is still carried out basically in public institutions, where admission is by contest and the number of women entering this career is very high.

What has changed in the profile, ambitions, and performance of new forensic toxicology researchers since the beginning of your career?

In these 40 years in which I have been working with forensic toxicology, I realize that the experts, who were formerly technical professionals, started to behave as researchers and quite a significant number of experts have a master's and doctoral degree in this area of action. That is, the interface between the practice of the craft and a strong academic background has consolidated more and more in recent years.

Could you briefly comment on recent developments in forensic and toxicological research?

Forensic research has grown significantly in Brazil and all of the world. Specifically, in relation to forensic toxicology, there has been a great advance in how the substances are identified using high resolution spectrometers, differentiating masses in the order of a thousandth of m/z . There has also been great progress in analytical measurements and the reliability of these measures. I explain, we went from an order of magnitude of ppm to ppb in analysis of *in natura* substances of toxicological interest, and from ppm to ppt in analysis of biological fluids that explain that there is an intoxication of medical-legal interest. This analytical possibility allowed matrices such as hair, nails, bones, etc. to be used as evidence of exposure.

Could you tell us how you got into the research area? Would you highlight any of your research works?

My entrance in the research area occurred when, after 10 years working with forensic toxicology at IML-SP, I decided to enter academic life, motivated by the demands that have arisen in professional work. In this sense, I would point out, for its historical value, the work of quantifying cocaine, its biotransformation products, and cocaethylene, which made possible the postmortem diagnosis of cocaine intoxication. I would also highlight the development of the analytical validations that allow the knowledge of analytical figures of merit, essential in the conduct of a legal procedure.

How do you keep yourself informed about the progress of scientific research in your area? What is your opinion about the current progress of this research in Brazil? What are the recent advances and challenges in scientific research in Brazil?

I mainly follow the works of my former students, nowadays excellent researchers. As in all areas of science in Brazil, the development of research in the forensic and toxicological area is very difficult because of the government's budget control over the state-level research promotion foundations, but also because of the bureaucracy involved to buy specific reagents and inputs, which can take years and seriously affect the start time or the completion of a research study. While a researcher in the US or Europe takes four weeks to plan and perform an *in vitro* test to find out what is the mechanism of action of a new drug, in Brazil that same study can take at least six months to a year because of the huge bureaucracy!

Today, the most recent advances in forensic toxicology research are analyses of new psychoactive substances (NPS), which are novel molecules with potent psychoactive properties that are synthesized and sold for recreational use. As there is a lack of information on the toxicity of these NPS, researchers in Brazil and in the world are conducting studies to find out how to identify these NPS *in natura* and in different biological materials and also to determine their detection time, their action in an organism, and the mechanism of this action, among other studies such as the influence of these NPS on driving a vehicle.

Could you mention some milestones of the breakthroughs in your area of expertise?

There are many. I would highlight the residue analyses performed thanks to the advancement of techniques that allow one to identify and quantify very low concentrations in biological material. I cite

the NPS as an example. If these NPS were synthesized in the 1980s - 90s, we would certainly have an extensive amount of work to just identify them. The advancement of analytical techniques has led to this identification.

Another milestone is the use of low volumes of biological samples for routine toxicological tests or even dry blood drop analysis, as for example in the Newborn Screening Test. To get an idea, an emergency toxicological analysis on a baby or a newborn needed a blood volume of the order of milliliters, and collecting that volume from a baby is actually very difficult. Today, volumes in the order of microliters are used; that is only one drop of blood and this facilitates the collection and reduces the suffering of the child and parents.

It is also important to highlight the decoding of exposure indicators, as well as the interpretation of their presence. Analysis of residues at trace levels of various chemical substances in the environment such as pesticides, drugs, metals, etc. indicate that we are polluting our planet more and more, year after year, and with this we are seeing an increase in the incidence of some diseases that were not prevalent in past decades.

And specifically, in the forensic area, I can highlight spectral interpretation techniques that allow the identification and quantification of NPS used as drugs of abuse without it being known that they are circulating in the illicit market. For example, there are cases, sometimes well-publicized in the media, in which a healthy young man who was at a party having fun had been found unconscious and had died in a hospital. The elucidation of the cause of death by an exogenous agent such as an NPS will serve to ensure that measures to control access to these NPS are adopted by regulatory agencies and that medical research is initiated in the search for a treatment and even an antidote for reversing intoxication.

There are in Brazil and in the world several meetings on the forensic and toxicology field. To you, how important are these meetings to the scientific community?

They are essential for any professional who works in these and other scientific areas. These are moments where important face-to-face contacts are established for discussions and for establishment of networking, partnership projects, thematic projects and, above all, the possibility of peer-driven professional growth. In these moments, the professionals are motivated to seek formal professional growth through the completion of post-graduate courses at the *lato* or *stricto sensu* level, eventually to carry out exchanges at other scientific centers, including abroad. Usually this perception of professional growth is accompanied by great satisfaction and joy, which is extremely gratifying.

You have already received some awards. What is it like to receive this kind of recognition? What is the importance of these awards in the development of science and new technologies?

It is always wonderful to have your work recognized, especially when this recognition comes from your peers, those who work in the same area and know the difficulties of developing a quality work in this area of knowledge. Unfortunately, we live in a country where the sciences in general, and the forensic sciences in particular, are little recognized. These awards (already well-known in the societies representing toxicology and forensic science professionals) and the advent of TV serials related to the subject have propelled, through public opinion and the lay press, the forensic sciences that now integrate the thematic areas of main research funding agencies in Brazil.

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

It is fundamental. Without such support, any forensic research would be impossible. This is an area where any interference by the private sector is impossible but, in many cases, it can subsidize research in some way. In Brazil, research is, as a rule, maintained by funding agencies. We still do not have the culture of interaction between research institutes and universities with private companies, but specifically in forensic toxicology, this possibility does not apply.

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?

I find this situation calamitous for ongoing research and for those that have not even started. One of the greatest challenges, which constitutes a barrier to Brazil becoming a scientific power, is the bureaucratization of the import policy of scientific material, such as analytical standards that, moreover, sometimes have prohibitive prices for a project. Added to this is the budget cut that has been affecting us since 2016 and which seems to have no prospect of being reversed. At times like this, with so many demonstrations of the importance of technical-scientific development in actions to prevent and solve problems, the finding that investment in research is not in the Brazilian government's agenda further aggravates the situation in which we find ourselves.

However, my message to young researchers is this: Do not give up on your dreams! Seek academic education and publish articles, even if you consider that what is being produced has no relevance. Expose your projects and studies to the scientific community and society. Participate in the meetings of professionals in your area. Discuss and participate as scientists and, especially, as citizens.

You have more than 30 years of dedication to the development of scientific research. Could you highlight what were the most important moments of these years?

There are several important moments that I could mention. One of the most important was my decision to pursue academic life when I was working for 10 years at the Legal Medical Institute. The job I was doing fascinated me. As I have already mentioned, being able to speak for those people who have died (what happens in the post mortem analyzes) has always thrilled me and very early I was aware that without science, it is impossible to carry out this task with such responsibility. I understood that in academic life I could reconcile these two aspects of my work, and it happened. To do the master's and then the doctorate, both absolutely inserted in my professional area, was fundamental in my career. Another important moment was the invitation for me to teach toxicology classes, initially at the Faculty of Pharmaceutical Sciences of Oswaldo Cruz Colleges, and then the invitation to be responsible for the forensic toxicology course in the postgraduate program at the University of São Paulo and to integrate the adviser group of this program. I am very pleased to have been able to make this link between academia and practice, transforming academic knowledge to benefit society. However, without a doubt, I think that my greatest achievement was to have participated in the training of professionals who are now professors and experts who carry out their work with ethics and competence. This is my pride!