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VIRULENCE PROFILE



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Juliana Campos Junqueira

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Tell us about your early days

I was raised in São José dos Campos metropolitan area (São Paulo/Brazil), where I lived with my parents in front of a pretty wooded square. I used to play, run, and ride a bicycle with my sister and the kids of the neighborhood. During this time, I met many kids who are still my friends to this day. I loved working on school activities and my dream was to become a teacher. During high school, I took a course to be a kindergarten teacher and I worked in a public school for a short time. As I wanted to continue my education at a prestigious college, I decided to spend my time studying for the entrance examinations. At that moment, I started to get interested in biological and health sciences. In 1995, I attended dental school at São Paulo State University (Unesp) where my scientific life began.

How did you get interested in science?

As an undergraduate at dental school, I had a great interest in natural sciences including anatomy, biochemistry, histology, microbiology and immunology. During that time, I had a microbiology and immunology professor who inspired me to work with scientific research. His name is Antonio Olavo Cardoso Jorge, known by students as Prof. Olavo. Prof. Olavo is a very respectable professional with an extended background in microbiological research. He was my research mentor during my four years in college. Prof. Olavo taught me how to work with bacteria and fungi in the laboratory, as well as to elaborate and develop projects. We had 2 projects approved by São Paulo Research Foundation (FAPESP) in which I received Scientific Initiation scholarships. For the first project, we worked with phenotypic characterization of *C. albicans* strains, and in the second project, we investigated the adherence of *Streptococcus mutans* on amalgam and the development of dental caries in

patients with interproximal restorations. These studies were awarded at two Brazilian meetings (specifically, the 4th Congress of Former Students of São José dos Campos Dental School/UNESP and the 15th Meeting of the Brazilian Society of Dental Research (SBPqO)) and published in specific dental journals. Therefore, I concluded college motivated to continue my studies in natural sciences and I was completely determined to pursue an academic career.

Tell us about your education and experiences at university

Right after college, I started my postgraduate studies at the oral biopathology postgraduate program at Unesp. This program is focused on fundamental sciences applied to health sciences with emphasis on dentistry. Initially, I did my masters with a focus on oral pathology where I had the opportunity to learn about oral infectious diseases, histological analysis, and different techniques of study invertebrate animal models. After that, I did my doctorate in oral microbiology and immunology and the aim of my doctoral thesis was to investigate the influence of estrogen and progesterone levels in the oral candidiasis using animal models. It was a very productive time, in which I could work in the microbiology laboratory and simultaneously participate in several research projects with oral pathogens that were being developed by professors of Unesp. Some of those projects involved collaborations with other institutions and, consequently, I had the chance to work as a visiting student on the University of Campinas (UNICAMP), University of Taubaté (UNITAU), and Federal University of São Paulo (UNIFESP). Another interesting event at that phase in my life was my first professional travel abroad. Unesp sponsored me to present a study at the Annual Meeting of International Association for Dental Research (2001) that was held in Chicago. This experience was amazing and unforgettable for a graduate student.



About Juliana Campos Junqueira. Dr. Junqueira received a Doctor of Dental Surgery degree (1998) and a PhD in Oral Biopathology (2003) from São Paulo State University (Unesp) where she has remained to this day to become Associate Professor of Microbiology and Immunology at Department of Biosciences and Oral Diagnosis, Institute of Science and Technology. She has co-authored more than 70 papers and book chapters on the biology of oral microbiota, virulence of bacterial and fungal pathogens, and development of vertebrate and invertebrate models for the study of host-pathogen interactions.

What was your first position after university? What is your current position at your institution?

As soon as I concluded my doctorate, I started working in the Institute of Science and Technology (ICT) at Unesp as Assistant Professor of Microbiology and Immunology for the Dentistry course (2004). I also became professor in the Postgraduate Course in Oral Biopathology and a mentor for masters and doctoral students. In the following years, I had several appointments at ICT/Unesp, including the following: member of Animal Research Ethics Committee, Coordinator of Board of Trustees of Foundation for Teaching and Research, Coordinator of Biohazard Committee, Vice-Coordinator of the Department of Biosciences and Oral Diagnosis, member of Education Committee, member of Research Committee, and Coordinator of Postgraduate Course. These appointments were very important for me to really understand the administrative processes involved in the dynamics of education and research of universities. I believe that these experiences helped me to become a better professor and researcher. Finally, I became Associate Professor in 2011 and Researcher on Productivity at the National Counsel of Technological and Scientific Development (CNPq) in 2016.

When and where did you start your own laboratory? How many people work in your laboratory?

Since the beginning of my career at Unesp, I have stayed in the laboratory of Prof. Olavo. We have been

working very closely all these years. In the course of time, I've received grants that have allowed me to purchase new equipment and introduce additional techniques for our research projects. Most of the grants I received were sponsored by FAPESP, which is an independent public foundation with the mission to foster research and technological development in the state of São Paulo. FAPESP is a serious and well-managed institution fundamental for the scientific progress of the state universities of São Paulo. Currently, our laboratory is well equipped and divided into specific areas for the projects of bacteriology, mycology, molecular analysis, immunology, and invertebrate models. On average, we have 20 to 30 students working in the laboratory, including undergraduate and students of masters, doctoral and post-doctoral courses. We make a great team.

What areas or topics does your laboratory currently focus on?

Our laboratory focuses on the studies of host-pathogen interactions in animal models and the discovery of potential antimicrobial agents that can be used in the oral cavity to prevent and treat infectious diseases.

For the study of host-pathogen interactions, we have been establishing different models of oral candidiasis, dental caries, and periodontal diseases in rats and mice. The induction of these infectious diseases is based on the oral inoculation of virulent strains and on the use of various predisposing factors. In 2010, because of the experience that I obtained in my research internship abroad, we started working with invertebrate models of *Galleria mellonella* (*G. mellonella*) and *C. elegans*. With these models, we can study the virulence and sensitivity to antimicrobials of various microorganisms relevant for the oral cavity, such as *Candida* spp., *Streptococcus mutans* (*S. mutans*), *Enterococcus faecalis*, *Porphyromonas gingivalis*, etc. The invertebrate models have been very useful for us to screen virulence factors and antimicrobial agents for tests in rats and mice models.

We work with these models to investigate alternative methods to the control of oral infectious diseases. Among them, most of our studies have been performed to evaluate the antimicrobial and immunomodulatory effects of photodynamic therapy (PDT). We investigate the effects of PDT on Gram-positive bacteria, Gram-negative bacteria and fungi, evaluating different photosensitizer and light source capable of achieving a significant reduction in the number of microorganisms in planktonic cultures and biofilms. We also investigate whether PDT promotes cellular

morphological alterations in bacteria and fungi and is capable to inhibit the microbial virulence factors of the surviving cells.

Another area that we have significantly worked in is the identification of new antimicrobial agents from the oral microbiome. As our research group knows, the oral cavity is colonized by different microbial species that are usually organized in biofilms. These species establish ecological interactions that can maintain oral health or cause diseases. Therefore, knowledge of the natural mechanisms whereby microorganisms compete with each other and establish antagonistic interactions can contribute to the discovery of new therapeutic strategies against oral pathogens. Our recent studies demonstrated that *S. mutans* culture filtrate exerts inhibitory effects on the biofilm formation, morphogenesis and pathogenicity of *C. albicans*, attenuating the experimental candidiasis in animal models. Since these results suggest that *S. mutans* produce signaling molecules with antifungal activity, our current studies are focused on the identification of antimicrobial molecules. In addition, we verified that *Lactobacillus* strains isolated from the individuals with oral health are able to protect the host against *Candida* infections. Therefore, now we are conducting a thorough investigation of *Lactobacillus* strains with potential to be used as a probiotic in the oral cavity.

Do you have partners that are important for your research projects?

Yes, most of our investigations were developed with the collaboration of researchers that have experience in specific subjects of pathology, pharmacology, biochemistry, periodontics, endodontic, dental prostheses, medicine, engineering, chemistry, and physics. Currently, our laboratory collaborates with other researchers of ICT/Unesp, mainly Ana Lia Anbinder in the studies of periodontal pathogens, and Luciane Dias de Oliveira in our studies with plant extracts. We also have partners from other faculties of Unesp, including Maria José S.M. Giannini and Ana Marisa F. Almeida in our studies with invertebrate models (Faculty of Pharmaceutical Sciences), and Dulce Helena S. Silva in the extraction of bacterial compounds (Chemistry Institute). Our current projects also have collaborators from other institutions, such as Juliana F. Strixino in PDT studies (University of Vale Paraiba/Brazil), Márcia C.A. Prata in the *G. mellonella* rearing (EMBRAPA/Brazil), Eleftherios Mylonakis, and Beth B. Fuchs in the identification of antifungal agents (Rhode Island Hospital, Brown University, USA) and Anita Shukla in the development of biomaterials for oral application (School of Engineering, Brown University, USA).

Tell us about the most important stages of your professional career. What are your main goals for the next 5 years?

I think that among the most important stages of my career, I can highlight the internship at Massachusetts General Hospital/MHG of Harvard Medical School (USA), the coordination of the postgraduate course at Unesp (Brazil), and the work as a visiting professor at Rhode Island Hospital/RIH of Brown University (USA). I did an internship at MGH in 2010 for a short period of time, but it was enough to learn the infection model of *G. mellonella* and implement this technique in Brazil. I also worked with different methodologies for tests of antimicrobial compounds and development of biofilms. I acknowledge that the contact with the researchers of the Division of Infectious Diseases, who have great experience in microbiology, allowed me to see new scientific horizons.

A few years later, I coordinated the Postgraduate Course in Oral Biopathology at Unesp for almost 3 years (2013–2016). In that period, I had a very great professional growth. Although I have a lot of administrative work at this time, I very much enjoyed participating in CAPES meetings to establish goals to improve the postgraduate courses in Brazil. CAPES (Coordination for the Improvement of Higher Education Personnel) is a foundation within the Ministry of Education (MEC) in Brazil whose central purpose is to coordinate efforts to improve the quality of Brazil's faculty and staff in higher education. Besides my professional growth, in that period I think that I contributed in some way so that our postgraduate course has become stronger and more competitive.

In relation to my phase as visiting professor at Rhode Island Hospital of Brown University (2016), I had a great opportunity to learn with experienced professionals how to elaborate projects that interfaced between basic, translational, and clinical research. Therefore, in the next 5 years I hope that these projects can generate new antimicrobial products capable to prevent or treat certain infectious diseases of the oral cavity.

What do you do for fun?

I enjoy spending my free time with my husband Adriano and my children Leonardo (12 years old) and Lucas (9 years old). We like to relax at home, ride our bikes, go to the movies, play in the pool, and travel. We also like to make pizza and barbecue with our family and friends at home. I am sure that the peace and happiness of being surrounded by my family all the time is fundamental to the progress of my academic career.