INTERVIEW

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INTERVIEWS PhD AWARD

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As readers certainly remember, the **Italian Society of Pharmacology (SIF)** published a call asking recent PhD graduates to submit a review article based on their thesis. This initiative was well received and we congratulate the winners. The possibility exists that SIF will make this a tradition and we encourage future graduates to start thinking of a suitable paper and submit it to PharmAdvances. In addition to facilitating a cash prize, single-author papers are valued by funding bodies and provide some competitive advantages when it comes to obtain funds (read the interviews to see how this is a major hurdle in scientific research).
For this issue of PharmAdvances, we interviewed the winners of the PharmAdvances PhD awards, namely Drs. **Francesca Lazzara** (FL) (1), **Amer Ahmed** (AA) (2), **Paola Brivio** (PB) (3), and **Chiara Colarusso** (CC) (4). In particular, we wanted to learn about their experience in the lab and what obstacles they had to overcome.
Their answers are very instructive and should help us shape a better university and education system.

1 | What is your scientific background? What did you study?

FL: I graduated in biology and, thereafter, I've attended laboratories of pathology and immunology. In 2016 I started my experience in the Lab of ocular pharmacology in the department of Biomedical and Biotechnological Sciences (University of Catania). In 2020 I finished my PhD in Neuroscience.

AA: My background encompasses Biochemistry, Biotechnology, and Pharmacology. I finished my Bachelor and Master degrees in Biochemistry and PhD in life sciences (research area: Vascular Pharmacology).

PB: I studied Pharmacy at the University of Milan and I conducted the internship for my master thesis in the laboratory of "*Psychopharmacology and Molecular Psychiatry*" directed by Professor Marco Andrea Riva at the Department of Pharmacological and Biomolecular Sciences of the University of Milan under the supervision of Professor Francesca Calabrese. I graduated in July 2015 with a thesis entitled "*Exposure to the chronic mild stress, in rats, alters the molecular mechanisms activated in response to a cognitive test*". In October 2015 I started the PhD program in Experimental and Clinical Pharmacological Sciences at the University of Milan and I defended the Ph.D. thesis entitled "*Stress exposure as risk factor for psychiatric disorders: from functional characterization to pharmacological intervention*" in December 2018.
Since 2019 I'm a post-doctoral fellow in the laboratory of Experimental Pharmacology of Professor Fabio Fumagalli. Since I have started to work in science, the main purpose of my research has been to investigate the effect of stress exposure during adult life, by focusing on molecular mechanisms responsible for the dif-

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ferent outcomes of stress response in the central nervous system.

CC: My scientific area of interest is to understand how lung inflammation fosters chronic lung diseases up to lung cancer. A particular interest concerns the role of the inflammasome, a multimeric complex that we proved to be involved in COPD-, pulmonary fibrosis- and lung cancer-related inflammation. During my PhD training I found that the inflammasome is at the crosstalk between chronic obstructive pulmonary disease (COPD) and lung cancer.

2 | What is the key message of your paper?

FL: Basically, the key message of this manuscript, and of my whole PhD thesis, is that pathological conditions, in my case diabetic retinopathy, can be characterized by novel and uninvestigated pathological mechanisms, that can be addressed after discovery and validation of druggable pharmacological targets. In particular, my thesis and this manuscript aimed at highlighting new putative pharmacological targets characteristic of the early stage of diabetic retinopathy.

AA: The key message of my paper, published in PharmAdvances, could be summarized as "Flavonoids consumption is associated with undoubtable beneficial effect in the cardiovascular context; this effect is the result of the pleiotropic mechanism of these valuable products of nature. These compounds exert anti-obesity effect, protect against hypertension development, ameliorate hyperlipidemia, and slow down the progression of diabetes and atherosclerosis".

PB: The key message of my paper "*The multifaceted aspects of stress*" is the fundamental need to study the consequences of stress exposure since it is one of the main environmental factors for developing psychiatric disorders. Moreover, it is necessary to pursue the research in this field to unravel the molecular mechanisms that may be at the basis of resilience for the study of novel pharmacological treatments to promote resilience.

CC: This paper highlights that the activation of a specific inflammasome receptor, AIM2, could be at the crossroad between COPD and lung cancer by acting as one of the orchestrators for the establishment of lung cancer in smokers. Therefore, we believe that this is a novel scientific approach for COPD patients that develop lung cancer, focusing on the biology of the AIM2 inflammasome as a potential pharmacological target which could on one side represent a diagnostic tool to early prevent COPD patients to develop lung cancer, and on the other side could open new therapeutic perspectives.

3 | If you had plenty of money, what would you study next?

FL: I would like to continue studies relative to several uninvestigated pathological mechanisms of retinal diseases. In particular, I would like to investigate further the role of specific angiogenic factors, which are the main protagonists of retinal degeneration (PlGF or the different isoforms of VEGFA). As everybody knows, researcher's activities and studies are costly, and my first purpose it would be to invest money in innovative lab equipment, in order to keep us at the forefront of the pharmacological research.

AA: If I had more money, I would continue my PhD work to investigate the long-term or chronic effect of flavonoids treatment on perivascular adipose tissue (PVAT) function. I would study the protective effects of flavonoids toward PVAT function in some diseases such as hypertension and obesity.

PB: In these years of academic research, I've increased my passion in science for the multifaceted effects of stress exposure, from the positive and negative consequences of stress at behavioral level to the molecular basis of stress. Hence, if I had plenty of money, I would employ novel and advanced techniques to better dissect the mechanisms altered in specific brain regions for the development of novel therapeutic strategies. Moreover, I would combine the results obtained at preclinical levels with collaborations with clinicians to identify innovative and specific targets for more effective interventions to treat stress-related disorders.

CC: I would like to further explore the molecular/cellular mechanisms involved in chronic lung inflammation at the basis of pulmonary diseases such as COPD, pulmonary idiopathic fibrosis, and lung cancer. In particular, I would focus on the inflammasome-dependent pathways puzzling from the process of lung cancer establishment up to progression that occurs after therapeutic treatment. In this regard, another goal I would like to reach is to understand cellular and molecular mechanism/s at the basis of immune checkpoint inhibitors' resistance in lung cancer patients and try to identify predictive and/or prognostic biomarkers able to define diagnosis of disease, treatment, efficacy assessment and disease progression. To achieve all these goals, I would like to take advantages of innovative experimental approaches, such as the spatial biology.

4 | In your opinion, what are the major obstacles in post-doctoral research?

FL: I think that all Italian PhD students and post-doc know well which is the main obstacles: access to research funds.

AA: In my opinion the major obstacles are funding and their scarcity.

PB: I believe that the major obstacles to post-doctoral research in Italy are the low number of grants to which post-doctoral fellows can apply to have money for conducting independent research and build their own group, the high level of competition in academy due to the few positions available with respect to the number of post-doctoral fellows and the precarious contracts and the low salaries in comparison to the other graduates who work in companies.

CC: Currently, I believe that the major obstacles in post-doctoral research are, on a hand, the poor financial support and resources and, on the other, the instability and uncertainty that characterize a post-doc researcher's life.

5 | What was the major challenge (technical, budgetary, *etc.*) you had to face in your own research?

FL: Maybe during PhD studies everything seems difficult. The main problem is the learning process: theory & practice. Students have to manage and balance time their own weakness and strength, in order to be productive and mentally healthy.

AA: The major challenge I faced in my PhD research was related to the approach I used to tackle my PhD research question. I have used a single classical pharmacological approach to investigate the modulation of flavonoids vascular reactivity by perivascular adipose tissue. I wanted to use in vivo experiments and or molecular approach to validate my result obtained by the classical pharmacological approach. This challenge also meant that I had less training during my PhD. This challenge was related to funding and bureaucracy re-

lated to the work with animal models as well as this challenge was in part caused by Covid-19 pandemic.

PB: In my opinion, the major challenge my colleagues and I had to face is the lack of personal budget to start conducting independent research. I believe that more calls for proposals directed to restricted groups or with specific thematic could increase the possibility to win a grant.

CC: The major challenge was to face a research project by using residual financial resources trying to obtain the more I could out of the planned experiments.

6 | What did your mentor teach you in addition to the scientific method?

FL: Scientific rigor and diplomacy.

AA: He taught me to be calm and cool when things are not going well in research.

PB: Since I started my journey in science, my mentor has passed to me the passion for this work, and the desire to continue research to reach my objectives in the field of neuroscience. Moreover, she has given me the possibility to join national and international congresses to share my data and to meet other young scientists to discuss about neuroscience, thus teaching me the importance of the attendance to these meetings for my personal growth thank to the face with other neuroscientists.

CC: My mentor taught me that in work, as well as in life, respect for the others and for the rules, honesty, humility, learning, listening to others and not being afraid to express your opinions are important. My mentor transmitted me the passion for scientific research and the importance of struggling to achieve a goal. This was for me a lesson of professional and personal growth, and of making mistakes to improve yourself.

7 | Should you become a mentor yourself, what would you tell your students upon joining your lab?

FL: Don't be too sure of yourself; always challenge yourself and be humble. Work and make sacrifices, that's the only way to get results.

AA: Yes, I wish to become a mentor and I will tell my student upon joining my lab "do not delay what you can do today until tomorrow, manage your time effectively, work as hard but wise as possible, do not try to do all things together, have enough time to work, read, relax and sleep".

PB: During these years in academy, I have had the opportunity to be the tutor of several students during their master thesis internship. I hope to have passed onto them (and as mentor I will do the same) not only my passion for this work but also the importance to work with passion and respect.

CC: My mentor taught me that in work, as well as in life, respect for the others and for the rules, honesty, humility, learning, listening to others and not being afraid to express your opinions are important. My mentor transmitted me the passion for scientific research and the importance of struggling to achieve a goal. This was for me lesson of professional and personal growth, and of making mistakes to improve yourself.

8 | If you were the Ministry of Research, how would you distribute funds?

FL: An equal distribution between Italian universities. Grades and scores assigned

to universities can be influenced by factors (*e.g.* environmental, economic) that create disparities between universities located in the northern and southern parts of Italy.
AA: I would focus the funds distribution towards more basic scientific research in medical and life sciences and toward innovative technologies in engineering and industrial sectors.

PB: If I were the Ministry of Research, I would distribute funds by opening several applications for the young scientists divided for specific themes and directed to more closed groups (for example, 1-2/3-4 (and so on) years after the PhD) to balance the curriculum vitae of the candidates and to increase the possibility of younger to win the grants.

CC: I would try to distribute funding in order to reduce the gap between the northern and southern universities, and between small and large universities. I would give more funding to applied research, and in the field of pharmacological research, to the basic one, and I would provide an increased number of grants pointing at increase investment in junior scientists.

9| What are you planning to do in the future?

FL: I hope to continue my post-doc in the field of ocular pharmacology, specifically on retinal function in *in-vivo* model of retinal degenerative disease. After that, "what's meant to be will be".

AA: In future, my plan is to pursue some postdoc research training (3-4 years) in order to enhance my skills and technical expertise, after which I would like to apply for some fixed-term or permanent positions and to establish my own research lines.

PB: I hope to continue my career in neuroscience and to conduct my independent research in the field of studying the effects of stress during the different phases of life.
CC: I'm planning to continue my research work by further enriching my cultural background, by expanding my knowledge in the pharmacological research field, by discovering innovative experimental approaches. I would like to learn about novel scientific discoveries and integrate them with my ideas, confront myself with leading researchers/scientists across the world in order to boost my career.

10| Is there anything you would say to undergraduates?

FL: Study, be patient and try to understand exactly what you want to do after graduation.

AA: Yes I would say them "find your interest intellectually, try to be creative with it, seek help whenever you need, do not plan to go for higher studies because it is not the best choice if you think about making money and enjoying life with family and friend, try to establish your own enterprise, higher studies do not suite everyone, academic life may compromise your happiness and enjoyment at several stages of life, and if mandatory that if you opt for higher studies you are mentally prepared for it".

PB: Even if is not an obligatory step of your studies, join the laboratory of research of your faculties to know this wonderful world!

CC: As stated by Steve Jobs '*The only way to do great work is to love what you do… Have the courage to follow your heart and intuition. They somehow already know what you truly want to become'*

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