

## PRESS RELEASE

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### **The European Research Council (ERC) Awards Four ERC Advanced Grants (11.5M€) to Life Sciences in Portugal**

The results of the most recent ERC Advanced Grants have been announced today (March 30th). The European Research Council (ERC) selected four new projects in the area of life sciences, which in total will receive 11.5M€. This number, awarded in the same contest, is a new record for our country.

In Portugal, the winning scientists are Isabel Gordo (Gulbenkian Institute of Science, IGC), Maria Manuel Mota (João Lobo Antunes Institute of Molecular Medicine, iMM), Mariana Pinho (ITQB-NOVA) and Henrique Veiga-Fernandes (Champalimaud Foundation). Each will receive between €2.5M and €3.5M for the development of research projects over the next five years.

The curriculum of these four researchers includes other funding awarded by the ERC, from the ERC Starting Grants (awarded at the beginning of their careers) to the ERC Consolidator Grants, including the ERC Proof of Concept (complementary funding for technology transfer projects from the laboratory to the market ) which represents an investment in science made in Portugal, by this entity, established by the European Commission in 2007, in the order of €23M.

Isabel Gordo, IGC

#### **Evolution in the gut in health and disease**

The microbiota in the mammalian intestine constitutes a complex ecosystem whose ecological and evolutionary rules we do not yet understand. The diversity of the microbiota is associated with states of health or disease. The reason for this association is yet to be discovered. In this project the researcher aims to unravel how natural selection operates to shape the diversity of bacteria in the gut of healthy and sick hosts. The questions and experiments the researcher will address in the project represent a marriage between the fields of evolution and medicine. The intention is to understand how the evolution of bacteria is altered in the context of diseases: inflammatory bowel diseases, including cancer, and obesity.

- **ERC Advanced: €2 500 000**
- Other ERC: Starting Grant €1 200 000
- Total: €3 700 000

The ERC Advanced Grant is so important to Isabel's research, she “wants to dedicate it to the future generation of Portuguese scientists” and send them an inspiring message “God to the sea the danger and the abyss gave. But it was in it that He mirrored the sky.” Isabel also emphasizes that “for the specific purpose of my project, I am forever indebted to the thoughts of the late Ukrainian-born biologist Ilya Ilyich Metchnikoff and the Russian Leo Tolstoy, whose book “Anna Karenina” inspired the main hypothesis I set out to test in this project. When we all decide to stand on the shoulders of giants, our limit is the sky”. The new ERC will allow the multidisciplinary team, led by Isabel Gordo, to understand fundamental mechanisms in controlled experiments so that, in the future, it will be possible to effectively modulate human and animal microbiome and contribute to a significant health improvement in the context of the ecosystem we live in.

**Bio:** Isabel Gordo graduated in Physics, at the Technical University in Lisbon (IST) and received a PhD in Evolutionary Genetics, with Brian Charlesworth, from the University of Edinburgh in 2002. Her Postdoctoral research was carried out at the Instituto Gulbenkian de Ciência where she then became leader of the Evolutionary Biology group in 2004. In her research she combines theoretical and empirical methods aiming at a better understanding of the major forces that shape variation in natural populations. Her group has been studying the evolution of bacteria in complex ecosystems, such as the gut microbiome, for over a decade. During her career, she has contributed to major scientific advances, namely in terms of understanding the factors involved in the rapid evolution of bacteria and the increase in levels of resistance to antibiotics. In 2010 Isabel won the ERC Starting Grant and in 2015 the FCT Investigator Consolidator Grant. She is the founder of the Portuguese Society for Evolutionary Biology, was elected a member of the European Molecular Biology Organization (EMBO) in 2017 and member of the European Academy of Microbiology in 2020 and is a council member of the European Society for Evolutionary Biology and of the International Society of Evolutionary Medicine and Public Health. She is now one of the 4 Portuguese researchers distinguished with the prestigious ERC Advanced Grant in 2023.

### Maria Mota, iMM

#### **Understanding the enemy, *Plasmodium*, to fight malaria**

Malaria is a devastating disease caused by the *Plasmodium* parasite. Despite a significant decrease in the incidence of the disease between 2000 and 2015, malaria is still a great concern for the World Health Organization, killing one child in the world every minute. It is therefore very important to understand the biology of the parasite to fight it. After an infected mosquito bite, the parasites must travel to the liver of the host and infect the liver cells. This stage of the infection is associated with exuberant parasite multiplication: each parasite gives rise to thousands of parasites capable of infecting the blood and causing disease. Today, it's known that the amount of parasites formed in the liver is associated with the severity of malaria. Interestingly, the division of parasites in the liver has some unusual features. Unlike our cells, the

parasites multiply, including their DNA, and only later become individualized parasites. Recently researchers showed that with such abundant multiplication and these characteristics, the multiplication of the parasites occurs with high occurrence of DNA damage in *Plasmodium*. Now, the researchers propose it confers greater genetic variability to the parasites: "In this project we will explore the hypothesis that the accumulation of DNA damage in the parasites generates high variability and diversity of parasites, which increases the probability that the parasites will escape the immune system of the host and cause severe disease. It's as if the parasites in the liver divide to conquer!", explains Maria Mota.

- **ERC Advanced: €2 500 000**
- Other ERC: Starting Grant €1 500 000 + PoC €145 500
- Total: €4 145 000

The funding awarded by the ERC will allow the multidisciplinary team led by Maria Mota to explore the relationship between the exacerbated division of the parasites and the severity of the disease. "Understanding these basic mechanisms of *Plasmodium* biology and interaction with the host will certainly open doors for the development of new strategies to fight malaria," adds Maria Mota.

**Maria Mota** graduated in Biology and obtained a Master's degree from the University of Porto. In 1998, she obtained a PhD in Parasitology from the University College London (UK). After a postdoc and teaching position at the York University Medical School, USA, in 2002 Maria returned to Portugal to lead a research group at the Instituto Gulbenkian de Ciência, in Oeiras. In 2005 she became a Professor at the Medical School of University of Lisbon and the leader of the Malaria Unit of the Instituto de Medicina Molecular João Lobo Antunes, Lisbon, where she is currently the Executive Director. Her research focuses on studying the interactions of *Plasmodium* parasites, causative agents of malaria, with their hosts. Her research team has made important contributions to the field of malaria namely on the identification of host molecules that dictate resistance or susceptibility to severe forms of the disease. Maria has been recognized with several distinctions, including several grants from the European Research Council, the EMBO Young Investigator Award and the Pessoa Prize.

Mariana Pinho, ITQB NOVA

### **Finding the missing links in the bacterial cell cycle**

Antibiotic resistance poses one of the most significant health problems of our time, with multidrug-resistant bacteria expected to claim over 300 million lives over the next 35 years. One

of the leading causes of this mortality is *Staphylococcus aureus*, a pathogenic bacterium studied by Associate Professor Mariana Pinho's group at ITQB NOVA. Her research has been continuously funded by the ERC since 2013, highlighting the importance of this critical global challenge.

For a bacterial cell to grow and divide, a complex series of events, such as DNA replication or construction of the cell wall, must occur in a coordinated and orderly manner. Mariana's research aims to uncover unknown links between these key events in the cell cycle, enabling the identification of vulnerable points where antibiotics can be more effective.

"Despite our knowledge about the individual events in the cell cycle, we know very little about how they are coordinated. This coordination is essential for the survival of bacterial cells, and therefore for their ability to cause infections. Our aim with this project is to find the missing links between major cell cycle events, while also developing tools and assays useful for antibiotic discovery.", says the researcher

This work complements the work developed in the two previous grants. In 2012 (Starting) and 2017 (Consolidator), the focus was on the intracellular organization of *Staphylococcus aureus* and its cell cycle, with the objective of better understanding how bacterial cells grow and divide, but also of using this knowledge to elucidate the mechanisms of action of various antimicrobial compounds. With this third grant, we want to go further. To think innovatively about new antibiotics, we need to know more about each cellular process, but also to understand how these processes are interconnected, to attack bacteria simultaneously at several critical targets. The funding from this ERC grant will allow us to buy state-of-the-art equipment to study the division machinery of bacteria with exceptional spatial and temporal resolution", adds the researcher.

- **ERC Advanced: €3 000 000**
- Other ERC: Starting Grant: €1 657 000; Consolidator: €2 533 500
- Total: €7 190 500

**Bio:** Mariana Gomes de Pinho has a degree in Applied Chemistry by the NOVA School of Science and Technology (FCT NOVA). She began her research career studying mechanisms of antibiotic resistance in Hermínia de Lencastre's Laboratory, in ITQB NOVA. In 1997, she moved to the Rockefeller University, New York, where she did her PhD work in the Laboratory of Alexander Tomasz. In 2001, she joined Jeff Errington's Laboratory at Oxford University, UK, to study the intracellular organisation of bacteria. She returned to Portugal and, in 2006, started her own research group, the Bacterial Cell Biology Laboratory, at ITQB NOVA. She has three daughters and is a member of the European Academy of Microbiology (EAM), the European

Molecular Biology Organization (EMBO) and the Academia Europaea. Mariana Pinho has won three consecutive ERC grants: Starting (2012), Consolidator (2017) and Advanced (2023).

Henrique Veiga-Fernandes, CF

### **The neuroimmune crosstalk and its potential therapeutic value**

Maintenance of health requires the coordination of multiple cellular networks. For example, the immune and nervous systems cooperate to regulate tissue homeostasis. Concomitantly, recent work from the group led by Henrique Veiga-Fernandes demonstrates that the immune system, through white blood cells, integrates neuronal signals to control tissue health and immunity. These findings are provoking a paradigm shift in our understanding of the immune response, neuroimmune crosstalk and its potential therapeutic value.

“This funding from ERC will allow us to apply a series of disruptive tools, developed by our group, that will address a gap that existed in the field of approaches to explore the identity and plasticity of neuroimmune interactions, in great detail, and in a specific manner, in living organisms”, explains Henrique Veiga-Fernandes. With these tools and the ERC Advanced Grant, the group will be able to test the hypothesis that dynamic circuitry codes orchestrate neuro-immune interactions and disease outcomes. “This project will allow us to apply cutting-edge technologies to address and advance, with unprecedented mechanistic and conceptual detail, how the neuroimmune interactome unfolds, in health and disease.”, concludes Henrique Veiga-Fernandes.

- **ERC Advanced: €3 500 000**
- Outras ERC: Starting €1 901 400 + Consolidator €2 270 000 + PoC 1 €150 000 + PoC 2 €150 000
- Total: €7 971 400

**Bio:** Henrique Veiga-Fernandes graduated in Veterinary Medicine at Universidade de Lisboa, Portugal and was awarded a PhD in molecular and cellular biology from Université René Descartes, Paris, France. He developed his post-doctoral research at Institut Necker in Paris, France and at the National Institute for Medical Research, London, UK. He started his own group in 2009 at IMM Lisboa, Portugal, where he was on the Board of Directors from 2014 to 2016. He joined the Champalimaud Foundation as a principal investigator in 2017, where he is also the co-director of Champalimaud Research. He made important contributions to the understanding of immunological memory, innate lymphocytes and neuroimmune interactions. Among other distinctions, he received several European Research Council grants, several Pfizer prizes in basic science, and he was elected as EMBO member in 2015 and Allen Distinguished Investigator in 2018.

About the European Research Council (ERC) Grants

ERC Research Grants are awarded by the European Research Council. Any researcher can apply, as long as they intend to develop their research in an institution of the European Union. Without quotas by countries, areas or anything else, these grants are awarded based, solely and exclusively, on the merit of the project. Funding is for the development of projects over a period of five years and is allocated at three main levels, according to the seniority of the proposing researcher: Starting, for researchers with 2 to 7 years after their PhD, in an amount of up to €1.5M; Consolidator, for researchers with 7 to 12 years after their PhD and funding of up to €2M; Advanced, for independent researchers, worth up to €2.5M. To these values can be added initial support, for rehousing or scientific equipment.

In addition to the three levels, the ERC has two additional funding systems: Proof of Concept, for researchers who already have an ERC grant and want to explore the technology transfer potential of their research; and Synergy, for groups of two principal investigators who want to work together on a project. These grants have a maximum value of €150K for 18 months and €10M for 6 years, respectively.