Prof. Marcelo Jacobs-Lorena

Professor

Johns Hopkins School of Public Health, USA

Dr. Marcelo Jacobs-Lorena received the BSc degree from the São Paulo University, Brazil, the MSc degree from the Osaka University, Japan and the PhD degree from the Massachusetts Institute of Technology, USA. He then trained as a postdoctoral fellow at the University of Geneva, Switzerland. From 1977 to 2003 Dr. Jacobs-Lorena was a faculty in the Department of Genetics at Case Western Reserve University in Cleveland, Ohio. It was during this time that he initiated molecular studies on the interaction of the malaria parasite with its vector mosquito. These studies have led to the generation of the first genetically engineered mosquito refractory to the malaria parasite. Since 2003 Dr. Jacobs-Lorena has been a Professor at the Johns Hopkins School of Public Health and Malaria Research Institute in Baltimore, Maryland. Here his research continues to explore the molecular events driving the development of the malaria parasite in his mosquito and mammalian hosts.

His research focuses on the life cycle of the malaria parasite in its obligate mosquito vector. His laboratory was the first to produce a genetically engineered mosquito that is refractory to the parasite. Presently we are exploring an alternative strategy by engineering bacteria that live in the mosquito gut to produce anti-malarial compounds. Other projects in the lab investigate mechanisms of parasite fertilization in the mosquito, mechanisms of sporozoite liver invasion and role of the mammalian fibrinolytic assist Plasmodium in its cycle in the vertebrate and invertebrate hosts.

Dr. Jacobs-Lorena has over 150 publications in peer reviewed journals, has chaired for 6 years the World Health Organization Committee on Molecular Entomology and is on the editorial board of three scientific journals. In 2009 he was elected Fellow of the American Association for Advancement of Science (AAAS) and in 2016 elected Fellow of the American Academy of Microbiology.

PROFESSIONAL EXPERIENCE

1965-68. Graduate research (Master's) at the University of Osaka, Osaka, Japan.

Advisor: Dr. A. Tsugita. Elucidation of the amino acid sequence of wild type and double-frameshift mutant lysozyme from T4 phage. This work confirmed for the first time the genetic code via *in vivo* experiments.

1968-72. Graduate research (Ph.D.) at M.I.T., Cambridge, Massachusetts.

Advisor: Dr. C. Baglioni. Major areas of research: a) Mechanisms of protein synthesis using cell-free systems; b) Characterization of globin and histone mRNAs; c) Demonstration and characterization of maternal messenger RNAs in unfertilized sea urchin eggs.

1972-77. Postdoctoral research at the University of Geneva, Geneva, Switzerland.

Advisor: Dr. M. Crippa. Developed a method for the mass fractionation of *Drosophila* egg chambers. Initiated experiments on gene expression during *Drosophila* oogenesis.

1977-83. Assistant Professor, Department of Developmental Genetics & Anatomy, Case Western Reserve University, Cleveland, Ohio.

1983-93. Associate Professor, Department of Genetics, Case Western Reserve University, Cleveland, Ohio.

1993-2003. Professor, Department of Genetics, Case Western Reserve University, Cleveland, Ohio.

From 2003. Professor, Dept. Molec. Microb. Immunol., Johns Hopkins University, Baltimore, MD.

FELLOWSHIPS AND HONORS

- Fellowship, Japanese Ministry of Education (1965-68).
- EMBO long-term postdoctoral fellowship (1972-75).
- 2007 *Scientific American* magazine's "SciAm 50" award for work toward developing genetically-modified mosquitoes resistant to malaria. This annual award recognizes 50 individuals, teams and organizations whose accomplishments in research, business or policymaking demonstrate outstanding technological leadership.
- 2009 Elected Fellow of the American Association for Advancement of Science (AAAS).
- 2016 Elected Fellow of the American Academy of Microbiology.

SERVICE

- Member of the editorial board of "Insect Molecular Biology".
- Member of the editorial board of "Insect Biochemistry and Molecular Biology".
- Member of the editorial board of "Journal of Insect Science".
- World Health Organization. Member of the Committee on Molecular Entomology (from 1999). Chair 2002-2007.
- Founder and organizer of the "Vector Encounter", an annual meeting that brings together researchers with interests in insect vectors of disease. (from 1996).
- Member of the Advisory Board for the CRC Year Book of Developmental Biology (1988-1991).
- Member NIH Genetics Study Section (1986-90) [*ad hoc* reviewer (Feb 1985)].
- Member, NIH Biomedical Research & Training Study Section (1996-2000).
- Member, NIH Minority Programs Study Section (2002-2006).
- Member, NIH Vector Biology Study Section (2009-2012).
- *Ad hoc* reviewer of grant applications to the NIH (various study sections), to the NSF, to the Research Council of Canada, to the United States-Israel Binational Science Foundation, to the Wellcome Trust (UK), and to the Biotechnology and Biological Sciences Research Council (UK).

PUBLICATIONS (selected from a list of over 150 publications)

- Moreira, LA, Edwards, MJ, Adhami F, Jasinskiene N, James AA and Jacobs-Lorena M (2000) Robust gut-specific gene expression in transgenic *Aedes aegypti* mosquitoes. Proc. Natl. Acad. Sci. USA **97**:10895-10898.
- Ghosh AK, Ribolla PEM and Jacobs-Lorena M (2001) Targeting *Plasmodium* ligands on mosquito salivary glands and midgut with a phage display library. Proc. Natl. Acad. Sci. USA. **98**:13278–13281.
- Ito J-I, Ghosh A, Moreira LA, Wimmer EA and Jacobs-Lorena M (2002) Transgenic anopheline mosquitoes impaired in transmission of a malaria parasite. Nature **417**:452-455.
- Alphey L, Beard CB, Billingsley P, Coetzee M, Crisanti A, Curtis C, Eggleston P, Godfray C, Hemingway J, Jacobs-Lorena M, James AA, Kafatos FC, Mukwaya LG, Paton M, Powell JR, Schneider W, Scott TW, Sina B, Sinden R, Sinkins S, Spielman A, Touré Y and Collins FH (2002) Malaria control with genetically manipulated insect vectors. Science **298**:119-121.
- Marrelli MT, Li C, Rasgon J and Jacobs-Lorena M (2007) Transgenic malaria-resistant mosquitoes have a fitness advantage when feeding on *Plasmodium*-infected blood. Proc. Natl. Acad. Sci. USA., **104**:5580-5583. PMCID:PMC1838510.
- Dinglasan RR, Kalume DE, Kanzok SM, Ghosh AK, Muratova O, Pandey A and Jacobs-Lorena M (2007) Disruption of *Plasmodium falciparum* development by antibodies against a conserved mosquito midgut antigen. Proc. Natl. Acad. Sci. USA **104**:13461-13466. PMCID:PMC1948931.
- Dinglasan RR, Alaganan A, Ghosh AK, Saito A, van Kuppervelt TH and Jacobs-Lorena M (2007) *Plasmodium falciparum* ookinetes require mosquito midgut chondroitin sulfate proteoglycans for cell invasion. Proc.

Natl. Acad. Sci. USA. **104**:15882-15888. PMCID:PMC2000438.

- Fang W, Vega-Rodríguez J, Ghosh AK, Jacobs-Lorena M, Kang A and St Leger RJ (2011) Development of transgenic fungi that kill human malaria parasites in mosquitoes. Science **331**:1074-1077.
- Ghosh AK, Coppens I, Gårdsvoll H, Ploug M, and Jacobs-Lorena M (2011) *Plasmodium* ookinetes coopt mammalian plasminogen to invade the mosquito midgut. Proc. Natl. Acad. Sci. USA. **108**:17153–17158. PMCID:PMC3193258.
- Wang S, Ghosh AK, Bongio N, Stebbings KA, Lampe D and Jacobs-Lorena M (2012) Fighting malaria with engineered symbiotic bacteria from vector mosquitoes. Proc. Natl. Acad. Sci. USA, **109**:12734-12739. PMCID:PMC3412027.
- Vega-Rodríguez J, Ghosh AK, Kanzok SM, Dinglasan RR, Wang S, Bongio NJ, Kalume DE, Miura K, Long CA, Pandey A & Jacobs-Lorena M (2014) Multiple pathways for *Plasmodium* ookinete invasion of the mosquito midgut. Proc Natl Acad Sci USA, **111**:E492-500. PMCID:PMC3910608.
- Smith RC, Barillas-Mury C & Jacobs-Lorena M (2015) Hemocyte differentiation mediates the mosquito late-phase immune response against *Plasmodium* in *Anopheles gambiae*. Proc Natl Acad Sci USA **112**(26):E3412-3420.
- Vega-Rodriguez J, Perez-Barreto D, Ruiz-Reyes A & Jacobs-Lorena M (2015) Targeting molecular interactions essential for *Plasmodium* sexual reproduction. Cell Microbiol. 17:1594-1604.
- Cha S-J, Park K, Srinivasan P, Schindler CW, van Rooijen N, Stins M & Jacobs-Lorena M (2015) CD68 acts as a major gateway for malaria sporozoite liver infection. J Exp Med J Exp Med **212**(9):1391-1403.
- Goodman CD, Siregar JE, Mollard V, Vega-Rodríguez J, Syafruddin D, Matsuoka H, Matsuzaki M, Toyama T, Sturm A, Cozijnsen A, Jacobs-Lorena M, Kita K, Marzuki S & McFadden GI (2016) Parasites resistant to the antimalarial atovaquone fail to transmit by mosquitoes. Science **352**:349-353.
- Cha SJ, Kim MS, Pandey A & Jacobs-Lorena M (2016) Identification of GAPDH on the surface of *Plasmodium* sporozoites as a new candidate for targeting malaria liver invasion. J Exp Med **213**:2099-2112.
- McLean KJ & Jacobs-Lorena M (2017) *Plasmodium falciparum Maf1* confers survival upon amino acid starvation. mBio **8**:e02317-16. https://doi.org/10.1128/mBio.02317-16.