

CV ALFRED CORTÉS CLOSAS

Birth: 10 November 1971, Barcelona.

Languages: Catalan, Spanish, English, Melanesian Pidgin.

ICREA Research Professor at ISGlobal

Head of the Malaria Epigenetics Lab

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<https://www.isglobal.org/en/researchers/-/profiles/2000>

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EDUCATION

1999- PhD in Biology, University of Barcelona, Spain.

1994- BSc in Biochemistry, University of Barcelona, Spain. Average grade: 3.36 (0-4) (Extraordinary prize of the Biochemistry degree).

CURRENT POST

Since September 2012. **ICREA Research Professor** at Barcelona Institute for Global Health (**ISGlobal**, former CRESIB), Catalonia, Spain. Head of the Malaria Epigenetics lab. Main topics: transcriptional regulation and sexual conversion in malaria parasites.

PREVIOUS POSTS HELD

July 2011 – September 2012. **Assistant Research Professor** at **CRESIB**. Topics: epigenetic regulation of gene expression in the malaria parasite *Plasmodium falciparum* and adaptation of the parasite to changes in its environment.

July 2006 - July 2011. **ICREA Researcher** at the Ribas de Pouplana lab, Barcelona Institute for Research in Biomedicine (**IRB Barcelona**), Catalonia, Spain. Topics: epigenetic regulation of gene expression and invasion of red blood cells by malaria parasites.

February 2004 - July 2006. **Investigator Scientist** at Anthony Holder's laboratory, Division of Parasitology, MRC National Institute for Medical Research (**NIMR**), London, UK. Topic: regulation of gene expression and invasion of red blood cells in malaria.

February 2000 - October 2003. **Head of the Molecular Parasitology Laboratory** at the Papua New Guinea Institute of Medical Research (**PNGIMR**), Madang, Papua New Guinea. Topics: malaria vaccine development; red blood cell polymorphisms; *var*-genes expression; invasion of erythrocytes by *P. falciparum*.

December 1999 - February 2000. **Visiting scientist** at Robin Anders' laboratory, Department of Infection and Immunity, Walter and Eliza Hall Institute (**WEHI**), Melbourne, Australia. Topic: malaria vaccine development.

September - November 1999. Short-term **Research Fellow** at Hans-Peter Beck's laboratory, Department of Medical Parasitology and Infection Biology, Swiss Tropical Institute (**STI**), Basel, Switzerland. Topic: *var* genes expression in *P. falciparum*.

January 1995 - July 1999. **PhD Student** at Ferran Azorín's laboratory, Centre d'Investigació i Desenvolupament (**CID**) - CSIC, Barcelona, Spain. Topic: *Drosophila* single-stranded DNA binding proteins.

HONOURS and AWARDS

2022- Finalist (3 finalists) of the "Article of the year" award from the Catalan Society for Biology for the article Tintó-Font et al., & Cortés, *Nat. Microbiol.* 6:1163-74, 2021.

2021. Universitat Pompeu Fabra (UPF) PhD Programme in Biomedicine Special Award to Oriol Llorà-Batlle for his PhD thesis (defended in academic year 2019-20), conducted under my supervision.

2020- Finalist (3 finalists) of the "Article of the year" award from the Catalan Society for Biology for the article Bancells et al., & Cortés, *Nat. Microbiol.* 4:144-54, 2019.

July 2012- ICREA Research Professor contract. Highly competitive contract awarded by ICREA, an independent agency funded by the Catalan Government aiming to promote excellence science in Catalonia.

2011- EVIMalaR Affiliated member, competitive call.

2009- Competitive travel award from AGAUR (Catalan Research Funding Agency) for a research stay at NTU, Singapore.

2005- ICREA junior contract. Highly competitive five-year contract awarded by ICREA.

2005- *Ramón y Cajal* contract. Highly competitive five-year contract awarded by the Spanish Government. I renounced in favour of an ICREA junior contract.

2003- Travel award and "Young Investigator Honorable Mention" at the annual meeting of the American Society of Tropical Medicine and Hygiene (ASTMH). Philadelphia, USA.

1998- Extraordinary prize of the Biochemistry degree, Universitat de Barcelona.

RESEARCH STAYS and main COLLABORATIONS (selection)

2020. INSERM (Paris, France), C. Lavazec lab. Purpose: Functional characterization of infected erythrocytes.

2020. Leiden University (The Netherlands), C.J. Janse lab. Purpose: mosquito infection studies.

2019. Imperial College (London, UK), J. Baum lab. Purpose: mosquito infection studies.

2017. The Wellcome Trust Sanger Institute (UK), O. Billker lab. Purpose: experiments in the mouse malaria model.

2016-2018. CSIC (Spain), E. Gómez-Díaz lab. Purpose: develop comparative ATAC-seq for malaria research.

2014-ongoing. Institute for Tropical Medicine (Antwerp, Belgium), A. Rosanas-Urgell lab. Purpose: molecular epidemiology studies. Two PhD students co-supervised.

2012. Co-host for a 6-months sabbatical stay at ISGlobal of Prof. M. Llinas (Princeton University, USA).

2010-ongoing. Princeton University /Pennsylvania State University (USA), M. Llinas lab. Purpose: functional characterization of *P. falciparum* ApiAP2 transcription factors.

2008-2013. Nanyang Technological University (Singapore), Z. Bozdech's lab. Purpose: custom glass microarray experiments.

2008-2011. Ikerlan (Arrasate, Spain), Microsystems department (private non-profit Technology research company). Purpose: development of a micro-fluidic closed circuit for blood.

2007-2014. IRB (Barcelona, Spain), L. Ribas de Pouplana group. Purpose: development of antibiotics targeting *P. falciparum* translation system.

2008-2011. IBEC (Barcelona, Spain), X. Fernández-Busquets group. Purpose: targeted drug delivery to *Plasmodium*-infected erythrocytes.

2004-2006. Sanger Center (UK), A. Ivens' lab. Purpose: Affymetrix microarray experiments.

2002-2003. Monash University (Australia), B. Cooke's lab. Purpose: to characterise cytoadherence of *P. falciparum* infected mutant erythrocytes under conditions of flow.

2000-2003. La Trobe University (Australia), Robin Anders lab. Purpose: characterisation of the vaccine candidate AMA1.

2000-2003. Swiss Tropical Institute (Switzerland), H.P. Beck lab. Purpose: analysis of *var*-gene expression in *P. falciparum* field isolates.

MANAGEMENT ACTIVITIES, PROFESSIONAL SOCIETY MEMBERSHIP and OTHER

From 2021. Chair (together with Dr. M. Guixens) of the Mentoring program and the Postdoctoral committee at ISGlobal.

2020. Organizer (together with Samuel Wassmer at LSHTM, UK, and Silvia Portugal at University of Heidelberg, Germany) of BioMalPar XVI (2020), an EMBL conference. Held virtually (instead of in Heidelberg, Germany) because of the COVID-19 situation.

2017. Organizer (together with Elisabeth Cardis) of the ISGlobal Scientific Retreat

2016-18. Co-coordinator of the Malaria Programme at ISGlobal (with Q. Bassat).

2016-17. Coordinator of the ISGlobal Research Support commission.

2015-18. Member of the Core Scientific Committee of the ISGlobal Alliance (integrated scientific committee including three scientists from ISGlobal and three from CREAL).

2014-18. Vice-chair of the CRESIB-ISGlobal Internal Scientific Committee (ISC).

From 2011. Affiliated member of the EVIMalaR Network of Excellence.

Member of the Spanish Society for Biochemistry and Molecular Biology (SEBBM).

Member of the Catalan Society for Biology (SCB), part of *Institut d'Estudis Catalans*.

2013. Programming in R language (Coursera online course completed, certificate awarded).

2010. Supervisor licence for radioactive facilities.

INVITED SPEAKER/ ORAL PRESENTATIONS (selection)

3rd Virtual Symposium on Advances in Malaria Research, United Scientific Group (USA), invited speaker, virtual, 2023.

"Chromatin and epigenetics symposium", invited speaker, Catalan Society for Biology, Barcelona, 2012, 2014, 2016, 2020, 2023.

KAUST, invited conference, Jeddah, Saudi Arabia, 2022.

Swiss TPH, invited conference, Basel, Switzerland, 2022.

JITMM, invited speaker, University of Mahidol, Thailand (virtual because of the COVID situation), 2021.

London Molecular Parasitology Club meeting, Crick Institute/LSTMH symposium in honour of Tony Holder's scientific career, invited speaker, London, UK, 2021.

University of Heidelberg, invited conference, Heidelberg, Germany, 2019.

University of Glasgow, invited conference, Glasgow, UK, 2019.

Universitat de Girona, invited conference, Girona, 2018.

Keystone symposia “Malaria: From Innovation to Eradication”, invited speaker, Uganda, 2017.

Wellcome Genome Campus, “CRISPR Approaches for Apicomplexans” retreat, Hinxton, UK, 2016.

LSHTM, invited conference, London, UK, 2016.

Annual meeting of the Spanish Society for Biochemistry (molecular parasitology session), Salamanca, Spain, 2016.

NIAID-NIH, invited seminar, Rockville, USA, 2015.

Swiss TPH, invited seminar, Basel, Switzerland, 2015.

EVIMalaR clusters 2&4 meeting, Geneva, Switzerland, 2014.

2nd DCEXS Symposium (UPF): “Perspectives in Evolutionary Biology”, Spain, 2013.

EMBO conference “Comparative Genomics of Eukaryotic Microorganisms”, invited speaker, Spain, 2013.

EVIMalaR clusters 2&3 meeting, Montpellier, France, 2013.

EVIMalaR clusters 1&2 meeting, Berlin, Germany, 2012.

Institut Pasteur, Parasitology and Mycology Departmental Seminar, Paris, France, 2012.

Molecular Approches to Malaria (MAM), Melbourne, Australia, 2012.

EVIMalaR cluster 2 meeting, Rome, Italy, 2011.

BioMalPar meeting, Heidelberg, Germany, 2011.

Annual meeting of the ASTMH, Washington DC, USA, 2009. Invited Speaker at the Satellite Symposium “Immune Evasion in Malaria”.

Pan-African MIM meeting, Nairobi, 2009.

BioMalPar meeting, Heidelberg, Germany, 2007.

Oxford University (Peter Medawar building for Pathogens Research), invited conference, UK, 2003.

Annual meeting of the ASTMH, Philadelphia, USA, 2003.

Malaria in Melbourne meeting (MIM), Melbourne, Australia, 2003.

Papua New Guinea Medical Symposium, Alotau, Papua New Guinea, 2002.

EVALUATION and SUPERVISION

External advisor for the DELGEME African training network, focusing on capacity building (predoctoral and postdoctoral) in the field of high-throughput (omics) malaria research. Participation in the Project development workshop (Bamako, Mali) in 2017.

Member of the SAF (Biomedicine)-SP5 (Infection and Immunity) **evaluation panel** (Spanish Government) for projects follow up (2014), grant proposal evaluation (2014, 2015 and 2019 calls), and Juan de la Cierva contracts evaluations (2018).

Ad hoc grant evaluator for the European Research Council (ERC), the Spanish Evaluation Agency (ANEP), the Catalan Agency for Research and Universities (AGAUR), the Wellcome Trust, Swiss National Science Foundation, the UK Medical Research Council (MRC), the Netherlands Organisation for Scientific Research (NWO), the FCT (Portugal), Agence Nationale de la Recherche (France), KAUST competitive research grants (Saudi Arabia), Institut Pasteur internal call (France), Fondation pour la Recherche Médicale (France), the Poland National Academy of Sciences, the Israel Science Foundation, and the United States-Israel Binational Science Foundation.

Regular **ad hoc peer-reviewer** for several scientific journals, including *Nature*, *Nat. Microbiol.*, *Nat. Commun.*, *PNAS*, *eLife*, *Cell Reports*, *Cell Reports Methods*, *Genome Res.*, *Genome Biol.*, *Mol. Syst. Biol.*, *Genome Med.*, *Nucleic Acids Res.*, *Blood*, *PLoS Biol.*,

PLoS Pathog., *PLoS One*, *Commun. Biol.*, *mBio*, *mSphere*, *Cell. Microbiol.*, *Mol. Microbiol.*, *Brief. Funct. Genomics*, *Sci. Rep.*, *J. Proteome Res.*, *Trends Parasitol.*, *Infect. Immun.*, *Drug. Resist. Updat.*, *Int. J. Parasitol.*, *Epigenetics*, *RNA Biol.*, *Front. Cell. Dev. Biol.*, *Am. J. Trop. Med. Hyg.*, *PLoS One*, *BMC Biol.*, *BMC Genomics*, *Malar. J.*, *Paras. Vect.*, etc.

Regular member of **PhD and MSc evaluating committees** (20 PhD thesis since 2010, including local and international Universities in France, Australia, South Africa, Belgium, Pakistan).

MSc thesis/internship supervision: 1) Sofía Mira, University of Barcelona (2012); 2) Luis M. Molinos, University of Barcelona (2012); 3) Elisabet Tintó, University of Barcelona (2014); 4) Oriol Llorà, Pompeu Fabra University (2015); 5) Evi van Schuppen, Radboud University (2015); 6) Júlia Romero, Pompeu Fabra University (2016); 7) Carla Sánchez, University of Barcelona (2017); 8) Rafael de Andres, Wageningen University (2019); 9) Rosa Herrera, University of Barcelona (2021); 10) Ingrid Peláez, University of Barcelona, (2022).

PhD Thesis Supervision: 1) Valerie M. Crowley, 2011, IRB Barcelona fellowship. Thesis title: “Epigenetic regulation of clonally variant gene expression in *Plasmodium falciparum*”. Pompeu Fabra University, best qualification (“excellent cum laude”). 2) Sofía Mira-Martínez, 2018, *TransGlobalHealth/Erasmus mundus* fellowship (EU). Thesis title: “A new mechanism of antimalarial drug resistance regulated at the epigenetic level”. Joint PhD ISGlobal / ITM (Antwerp, Belgium), co-supervisor: A. Rosanas. Universitat de Barcelona, best qualification (“excellent cum laude”). 3) Elisabet Tintó Font, 2019, MINECO pre-doctoral fellowship (former FPI). Thesis title: “Identification of PfAP2-HS as the master regulator of the heat shock response in the human malaria parasite *Plasmodium falciparum*”. University of Barcelona, best qualification (“excellent cum laude”). 4) Oriol Llorà Batlle, 2019, FPU fellowship (MECD, Spain). Thesis title: “Characterization of sexual commitment and the early steps of sexual development in the human malaria parasite *Plasmodium falciparum*”. University Pompeu Fabra, best qualification (“excellent cum laude”). 5) Harvie Portugaliza, 2020, *TransGlobalHealth/Erasmus mundus* fellowship (EU). Joint PhD ISGlobal / ITM (Antwerp, Belgium) / University of Amsterdam, co-supervisors: A. Rosanas, C. Pell. Thesis title: “Targeting Malaria Transmission: A Transdisciplinary Approach”. University of Barcelona, best qualification. 6) Anastasia Pickford, 2021, FI fellowship (AGAUR, Catalan Government). Thesis title: “Characterization of the role of epigenetic variation in the adaptation of malaria parasites to changes in the conditions of the human host”. University of Barcelona, best qualification (“excellent cum laude”). 7) Lucas Michel-Todó, 2023, MINECO pre-doctoral fellowship (former FPI). Thesis title: “Interplay of genetic, epigenetic and transcription factors in the regulation of transcriptional variation in *Plasmodium falciparum*”. University of Barcelona, best qualification (“excellent cum laude”).

GRANTS AWARDED (selection)

2023-2026. Co-Promoter (co-PI) for a Research Foundation – Flanders (FWO, Belgium) grant (IMMETASEX, G067823N). Title: “Host immune and metabolic determinants of sexual conversion in *Plasmodium* parasites”. Grant total: €598,000 (of which €38,160 are assigned to my team).

2023-2024. **Supervisor** for a Juan de la Cierva postdoctoral contract to Alba Pérez Cantero.

2022-2024. **Supervisor** for a Juan de la Cierva postdoctoral contract to Núria Casas Vila.

2020-2023. **Principal investigator** in a “Programa Estatal de I+D+i Orientada a los Retos de la Sociedad (Retos)” grant (PID2019-107232RB-I00), Spanish Ministry of Science and Innovation (MICINN). Title: “Transcriptional regulation of adaptation and developmental decisions in malaria parasites: from epigenetic variation to directed transcriptional responses”. Grant total: €278,300. In addition, the grant includes an associated 4-year pre-doctoral fellowship.

2019-2022. **Principal investigator** in a “La Caixa Health Research” grant (HR18-00267). Title: “Dissecting the initial molecular events that trigger sexual conversion and transmission in malaria parasites”. Grant total: €499,400.

2018-2021. **Supervisor** for a predoctoral fellowship (FPI, Spanish Government, associated with grant SAF2016-76190-R) awarded to L. Michel to work in the Malaria Epigenetics Lab.

2017-2020. **Supervisor** for a predoctoral fellowship (FI, Catalan Government) awarded to A. Pickford to work in the Malaria Epigenetics Lab.

2017-2019. **Principal investigator** in a “Programa Estatal de I+D+i Orientada a los Retos de la Sociedad (Retos)” grant (SAF2016-76190-R), Spanish Ministry of Economy and Competitiveness (MINECO). Title: “Investigating new aspects of the mechanisms and biological functions of epigenetic variation in malaria parasites”. Grant total: €302,500. In addition, the grant includes an associated 4-year pre-doctoral fellowship.

2017-2019. **Principal investigator** in a “Explora - Ciencia” grant (SAF2015-72117-EXP), Spanish Ministry of Economy and Competitiveness (MINECO). Title: “Sex determination in malaria parasites: a role for epigenetics?”. Grant total: €45,000.

2017-2019. **Supervisor** for a predoctoral *Erasmus mundus* (EU) fellowship (Transglobalhealth) awarded to H. Portugaliza to work at the Malaria Epigenetics Lab (main host) in collaboration with ITM (Antwerp, Belgium) and UvA (Amsterdam, Netherlands). Fellowship total: €122,400.

2015-2019. **Supervisor** for a predoctoral fellowship (FPU, Spanish Government) awarded to O. Llorà to work in the Malaria Epigenetics Lab.

2014-2016. **Principal investigator** in a “Programa Estatal de I+D+i Orientada a los Retos de la Sociedad (Retos)” grant (SAF2013-43601-R), Spanish Ministry of Economy and Competitiveness (MINECO). Title: “Epigenetic variation in malaria parasites: from regulatory mechanisms to parasite adaptation”. Grant total: €242,000.

2015-2019. **Supervisor** for a predoctoral fellowship associated to grant SAF2013-43601-R (former FPI) to E. Tintó, Spanish Ministry of Economy and Competitiveness (MINECO). Fellowship total: €82,400.

2014-2016. **Principal investigator** of the “Malaria Epigenetics Lab”: Emerging Research Group (2014 SGR 485) recognized and funded by the Catalan Government (SGR-AGAUR). Grant total: €11,000.

2014-2015. **Principal Investigator** in a SUMA / ACCIS-Global Alliance pilot project grant (CREAL-CRESIB-Catalan Government). Title: “Molecular Basis of Variation in the Sexual Conversion Rates of Malaria Parasites”. Fellowship total: €50,000.

2013-2015. **Supervisor** for a postdoctoral fellowship (**Beatriu de Pinós**, AGAUR, Catalan Government) awarded to C. Bancells to work in the Malaria Epigenetics Lab. Fellowship total: €77,136.

2013-2016. Pre-doctoral **Erasmus mundus** (EU) fellowship (Transglobalhealth) to S. Mira-Martínez for a joint PhD between ISGlobal (under my supervision), ITM (Antwerp, Belgium) and VU (Amsterdam, Netherlands). Fellowship total: €122,400.

2011-2015. **Affiliated member** of EVIMalaR, an FP7-funded (European Commission) Network of Excellence. Funding covers networking activities, conference attendance, etc. Grant total: €12,000,000 (between all partners).

2011-2013. **Principal investigator** in a “Plan Nacional I+D+I” grant (SAF2010-20111), Spanish Ministry for Science and Innovation (MICINN). Title: “Molecular basis of the epigenetic regulation of clonal variant gene expression in *Plasmodium falciparum*”. Grant total: €116,160.

2009-2011. Collaborator (PI: Lluís Ribas de Pouplana) in a FP7 (HEALTH) Collaborative Research Project (European Commission). Title: “MEPHITIS: Targeting protein synthesis in the apicoplast and cytoplasm of *Plasmodium*”. Grant total: €2,145,151 (between all partners).

2008-2010. **Principal investigator** in a FIS grant (PI070891), Spanish Ministry of Health. Title: “Mechanisms involved in silencing *Plasmodium falciparum* genes encoding ligands for erythrocyte invasion and phenotypes associated to the silencing or activation of these genes”. Grant total: €144.595.

2001-2003. **Principal investigator** in a WHO/TDR Collaborative Research Project grant, from the Pathogenesis and Functional Genomics Committee. Title: “Molecular Mechanisms Involved in the Protection of Ovalocytic Individuals Against Cerebral Malaria”. Grant total: \$62.200.

PATENTS

15 April 2011. European Patent application num. EP11382112.8, “Núcleo de impulsión para microbomba de fluidos”. Applicants: Ikerlan S. Coop., IRB Barcelona, ICREA. We have developed a blood microcirculation prototype, based on a diaphragm pump with cantilever valves, with potential applications in *Plasmodium* research.

PEER-REVIEWED SCIENTIFIC PUBLICATIONS

Articles under review, posted as preprints or in press:

Published articles:

L. Michel-Todó, C. Bancells, N. Casas-Vila, N. Rovira-Graells, C. Hernández-Ferrer, J.R. González & **A. Cortés**, **2023**, “Patterns of Heterochromatin Transitions Linked to

Changes in the Expression of *Plasmodium falciparum* Clonally Variant Genes”, **Microbiol Spectr.** 11:e0304922.

E. Tintó-Font & **Cortés A.**, 2022, REVIEW (News & Views): “How a malaria parasite becomes a male”, **Nature** 612:408-409.

H.P. Portugaliza, H.M. Natama, P. Guetens, E. Rovira-Vallbona, A.M. Somé, A. Millogo, D.F. Ouédraogo, I. Valéa, H. Sorgho, T. Halidou, N. van Hong, A. Siteo, R. Varo, Q. Bassat, **A. Cortés*** & A. Rosanas-Urgell*, 2022, “*Plasmodium falciparum* sexual conversion rates can be affected by artemisinin-based treatment in naturally infected malaria patients”, **EBioMedicine** 83:104198.

*equal contribution, co-corresponding authors

E. Tintó-Font & **A. Cortés**, 2022, REVIEW: “Malaria parasites do respond to heat”, **Trends Parasitol.** 38:435-49.

Cover image.

E. Tintó-Font, L. Michel-Todó, T.J. Russell, N. Casas-Vila, D.J. Conway, Z. Bozdech, M. Llinás & **A. Cortés**, 2021, “A heat-shock response regulated by the PfAP2-HS transcription factor protects human malaria parasites from febrile temperatures”, **Nat. Microbiol.** 6:1163-74.

In this manuscript we identified the transcription factor that regulates the protective heat-shock response in malaria parasites. Fever is the most characteristic symptom of clinical malaria; therefore, the heat-shock response plays a fundamental role for parasite survival in the human circulation. This is the first malarial transcription factor shown to drive a directed transcriptional response to an environmental condition.

This manuscript was highlighted in the News & Views: Thathy & Fidock, “Malaria parasite beats the heat”, **Nat. Microbiol.** 6:1105-7.

A.K. Pickford, L. Michel-Todó, F. Dupuy, A. Mayor, P.L. Alonso, C. Lavazec & **A. Cortés**, 2021, “Expression patterns of *Plasmodium falciparum* clonally variant genes at the onset of a blood infection in malaria-naive humans”, **mBio** 12:e01636-21.

In this manuscript we provide the first complete characterization of how *P. falciparum* uses its clonally variant genes at the onset of a blood infection in a new human host. We provide evidence for a reset of the epigenetic memory for the state of multiple clonally variant genes during transmission stages.

N. Casas-Vila, A.K. Pickford, H.P. Portugaliza, E. Tintó-Font & **A. Cortés**, 2021, “Transcriptional analysis of tightly synchronized *Plasmodium falciparum* intraerythrocytic stages by RT-qPCR”, **Methods Mol. Biol.** 2369:165-185. Published as chapter 10 of the book “Parasite Genomics” (Springer), ISBN: 978-1-0716-1681-9.

H.P. Portugaliza, S. Miyazaki, F.J. Geurten, C. Pell, A. Rosanas-Urgell, C.J. Janse & **A. Cortés**, 2020, “Artemisinin exposure at the ring or trophozoite stage impacts *Plasmodium falciparum* sexual conversion differently”, **eLife** 9:e60058.

In this manuscript we provide the first detailed characterization of the effect of artemisinin, the frontline antimalarial drug, on the sexual conversion rate of *P. falciparum*. The sexual conversion rate determines the balance between maintaining infection in the same host and transmission. We found that artemisinin can stimulate sexual conversion in a dose-, stage- and metabolic state-dependent manner.

O. Llorà-Batlle, L. Michel-Todó, K. Witmer, H. Toda, C. Fernández-Becerra, J. Baum & **A. Cortés**, 2020, “Conditional expression of PfAP2-G for controlled massive sexual conversion in *Plasmodium falciparum*”, **Science Advances** 6:eaaz5057.

In this article we describe the generation of engineered parasite lines in which massive sexual conversion can be conditionally induced. Using these parasite lines, it is possible to obtain >90% pure populations of the initial stages of sexual development, including sexually committed schizonts and sexual rings. As a proof of principle of the utility of our system, we provide a detailed transcriptional and phenotypic characterization of these previously elusive developmental stages. Our system will enable their characterization at multiple additional levels.

H.P. Portugaliza, O. Llorà-Batlle, A. Rosanas-Urgell & **A. Cortés**, 2019, "Reporter lines based on the *gexp02* promoter enable early quantification of sexual conversion rates in the malaria parasite *Plasmodium falciparum*", **Sci. Rep.** 9:14595.

S.A. Ralph & **A. Cortés**, 2019, REVIEW: "*Plasmodium* sexual differentiation: how to make a female", **Mol. Microbiol.** 112:1627-31.

O. Llorà-Batlle, E. Tintó-Font & **A. Cortés**, 2019, REVIEW: "Transcriptional variation in malaria parasites: why and how", **Brief. Funct. Genomics** 18:329-41.

S. Mira-Martínez, A.K. Pickford, N. Rovira-Graells, P. Guetens, E. Tintó-Font, **A. Cortés*** & A. Rosanas-Urgell*, 2019, "Identification of Antimalarial Compounds That Require CLAG3 for Their Uptake by *Plasmodium falciparum*-Infected Erythrocytes", **Antimicrob. Agents Chemother.** 63: e00052-19.

*equal contribution

C. Bancells, O. Llorà-Batlle, A. Poran, C. Nötzel, N. Rovira-Graells, O. Elemento, B.F.K. Kafsack & **A. Cortés**, 2019, "Revisiting the initial steps of sexual development in the malaria parasite *Plasmodium falciparum*", **Nat. Microbiol.** 4:144-54.

In this article we describe a novel pathway for sexual conversion of malaria parasites. Using the recently identified *pfap2-g* gene as a marker of sexual commitment, we identified the stages at which commitment can take place and demonstrate that sexual conversion can proceed with or without an additional cycle of replication after commitment.

J.L. Ruiz, J.J. Tena, C. Bancells, **A. Cortés***, J.L. Gómez-Skarmeta* & E. Gómez-Díaz, 2018, "Characterization of the accessible genome in the human malaria parasite *Plasmodium falciparum*", **Nucleic Acids Res.** 46:9414-31.

*equal contribution

S. Mira-Martínez, E. van Schuppen, A. Amambua-Ngwa, E. Bottieau, M. Affara, M. Van Esbroeck, E. Vlieghe, P. Guetens, N. Rovira-Graells, G.P. Gómez-Pérez, P.L. Alonso, U. D'Alessandro, A. Rosanas-Urgell* & **A. Cortés***, 2017, "Expression of the *Plasmodium falciparum* clonally variant *clag3* genes in human infections", **J. Infect. Dis.** 215: 938-45.

*equal contribution

A. Cortés & K.W. Deitsch, 2017, REVIEW: "Malaria Epigenetics", **Cold Spring Harb. Perspect. Med.** 7:a025528. This review is also published as a chapter for the book: "Malaria: Biology in the Era of Eradication" (ISBN 978-1-621821-22-9), **Cold Spring Harbor Laboratory Press**.

N. Rovira-Graells, S. Aguilera-Simón, E. Tintó-Font & **A. Cortés**, 2016, "New Assays to Characterise Growth-Related Phenotypes of *Plasmodium falciparum* Reveal Variation in Density-Dependent Growth Inhibition between Parasite Lines", **PLoS One** 11(10):e0165358.

N. Rovira-Graells, V.M. Crowley, C. Bancells, S. Mira-Martínez, L. Ribas de Pouplana & **A. Cortés**, 2015, "Deciphering the principles that govern mutually exclusive expression of *Plasmodium falciparum* *clag3* genes", **Nucleic Acids Res.** 43:8243-57.

In this article we demonstrate that mutually exclusive expression of *clag3* genes, which play a key role in solute transport, is not strict. Fitness costs and non-deterministic molecular interactions that favour mutual exclusion shape the expression patterns of this gene family.

E.M. Novoa, N. Camacho, A. Tor, B. Wilkinson, S. Moss, P. Marín-García, I.G. Azcárate, J.M. Bautista, A.C. Mirando, C.S. Francklyn, S. Varon, M. Royo, **A. Cortés** & L.

Ribas de Pouplana, **2014**, “Analogues of natural aminoacyl-tRNA synthetase inhibitors clear malaria *in vivo*”, **Proc. Natl. Acad. Sci. USA** 111:E5508-E5517.

B.F.C. Kafsack, N. Rovira-Graells, T.G. Clark, C. Bancells, V.M. Crowley, S.G. Campino, A.E. Williams, L.G. Drought, D.P. Kwiatkowski, D.A. Baker, **A. Cortés** & M. Llinás, **2014**, “A transcriptional switch underlies commitment to sexual development in malaria parasites”, **Nature** 507:248-52.

In this article we identify a transcription factor of malaria parasites termed PfAP2-G that controls the balance between asexual multiplication in blood and sexual development. The expression of PfAP2-G, the master regulator of sexual conversion, is regulated by epigenetic mechanisms, such that it is silenced by default. PfAP2-G expression is spontaneously activated in a small proportion of the parasites, which triggers the sexual conversion programme.

S. Mira-Martínez, N. Rovira-Graells, V.M. Crowley, L.M. Altenhofen, M. Llinás & **A. Cortés**, **2013**, “Epigenetic switches in *clag3* genes mediate blasticidin S resistance in malaria parasites”, **Cell Microbiol.** 15:1913-23.

In this article we demonstrate that malaria parasites can acquire resistance to toxic compounds, including antimalarial drugs, by transcriptional switches in the *clag3* genes controlled at the epigenetic level. These findings provide strong evidence for the adaptive role of clonally variant gene expression in malaria.

R. Hoen, E.M. Novoa, A. López, N. Camacho, L. Cubells, P. Vieira, M. Santos, P. Marin-Garcia, J.M. Bautista, **A. Cortés**, L. Ribas de Pouplana & M. Royo, **2013**, “Selective inhibition of an apicoplastic aminoacyl-tRNA synthetase from *Plasmodium falciparum*”, **ChemBiochem.** 14:499-509.

A. Cortés*, V.M. Crowley, A. Vaquero & T.S. Voss, **2012**, OPINION ARTICLE: “A View on the Role of Epigenetics in the Biology of Malaria Parasites”, **PLoS Pathog.** 8: e1002943. *: corresponding author.

N. Rovira-Graells, A.P. Gupta, E. Planet, V.M. Crowley, S. Mok, L. Ribas de Pouplana, P.R. Preiser, Z. Bozdech & **A. Cortés**, **2012**, “Transcriptional variation in the malaria parasite *Plasmodium falciparum*”, **Genome Res.** 22:925-38.

In this manuscript we comprehensively characterised transcriptional variation in *P. falciparum* at a genome-wide level. Our results indicate that *P. falciparum* can use bet-hedging strategies to adapt to changes in its environment.

Cover highlight. This manuscript was selected as one of the May 2012 highlights (in full) in Nature Reviews Genetics (T. Casci, 2012, “Adaptation: Malarial bet hedging”, **Nat. Rev. Genet.** 13:298-9).

P. Urban, J. Estelrich, A. Adeva, **A. Cortés** & X. Fernandez-Busquets, **2011**, “Study of the efficacy of antimalarial drugs delivered inside targeted immunoliposomal nanovectors”. **Nanoscale Res. Lett.**, 6:620.

V.M. Crowley, N. Rovira-Graells, L. Ribas de Pouplana & **A. Cortés**, **2011**, “Heterochromatin Formation in Bistable Chromatin Domains Controls the Epigenetic Repression of Clonally Variant *Plasmodium falciparum* Genes Linked to Erythrocyte Invasion”. **Mol. Microbiol.** 80:391-406.

In this article we demonstrate that spontaneous transitions between two possible chromatin conformations control the transcriptional state of several *P. falciparum* clonally variant genes. We also characterized in detail the histone modifications associated with the active or repressed state of these genes, and the modifications that maintain the epigenetic memory.

P. Urbán, J. Estelrich, **A. Cortés** & X. Fernández-Busquets, **2011**, “A nanovector with complete discrimination for targeted delivery to *Plasmodium*-infected versus non-infected red blood cells *in vitro*”. **J. Control. Release** 151:202-11.

N. Falk, M. Kaestli, W. Qi, M. Ott, K. Baea, **A. Cortés** & H.-P. Beck, **2009**, "Analysis of *Plasmodium falciparum* var genes expressed in children from Papua New Guinea". **J. Infect. Dis.** 200:347-56.

I.J. Wooley, P. Hutchinson, J.C. Reeder, J.W. Kazura & **A. Cortés**, **2009**, "South East Asian ovalocytosis is associated with increased expression of Duffy Antigen Receptor for Chemokines". **Immunohematology** 25:63-6.

A. Cortés, **2008**, REVIEW: "Switching genes on and off for erythrocyte invasion by *Plasmodium falciparum*", **Trends Parasitol.** 24:517-24.

A. Cortés*, C. Carret, O. Kaneko, B.Y.S. Yim Lim, A. Ivens & A.A. Holder, **2007**, "Epigenetic Silencing of *Plasmodium falciparum* Genes Linked to Erythrocyte Invasion". **PLoS Pathog.** 3:e107. *: corresponding author.

In this article we demonstrate that a large number of genes encoding ligands for erythrocyte invasion can be switched on or off epigenetically. We also demonstrate mutually exclusive expression for two of these genes.

A. Benet, T.Y. Khong, A. Ura, R. Samen, K. Lorry, M. Mellombo, L. Tavul, K. Baea, S.J. Rogerson & **A. Cortés**, **2006**, "Placental malaria in women with South-East Asian Ovalocytosis". **Am. J. Trop. Med. Hyg.** 75:597-604.

M. Kaestli, I.A. Cockburn, **A. Cortés**, K. Baea, J.A. Rowe & H.-P. Beck, **2006**, "Virulence of malaria is associated with differential expression of *Plasmodium falciparum* var gene subgroups in a case-control study". **J. Infect. Dis.** 193:1567-74.

A. Cortés*, M. Mellombo, C.S. Mgone, H.-P. Beck, J.C. Reeder & B.M. Cooke, **2005**, "Adhesion of *Plasmodium falciparum*-infected red blood cells to CD36 under flow is enhanced by the cerebral malaria-protective trait South-East Asian ovalocytosis". **Mol. Biochem. Parasitol.** 142:252-7. *: corresponding author.

In this article, we provide insights into the molecular mechanism of protection by SAO, the only known human mutation that confers specific protection against cerebral malaria. SAO can influence the tissue tropism of sequestered parasites, and high-level binding of infected erythrocytes to CD36 may reduce the risk of cerebral malaria.

A. Cortés, **2005**, "A chimeric *Plasmodium falciparum* *Pfnbp2b/Pfnbp2a* gene originated during asexual growth". **Int. J. Parasitol.** 35:125-30. **Cover Image.**

A. Cortés*, M. Mellombo, R. Masciantonio, V.J. Murphy, J.C. Reeder & R.F. Anders, **2005**, "Allele-specificity of naturally acquired antibody responses against *Plasmodium falciparum* apical membrane antigen 1 (AMA1)". **Infect. Immun.** 73:422-30. *: corresponding author.

A. Cortés*, A. Benet, B.M. Cooke, J.W. Barnwell & J.C. Reeder, **2004**, "Ability of *Plasmodium falciparum* to invade South-East Asian ovalocytes varies between parasite lines". **Blood** 104:2961-6. *: corresponding author.

In this article we establish that different parasite lines have different ability to invade erythrocytes from human individuals with the cerebral malaria-protective trait SAO. The results have profound implications for our understanding of both the mechanism of protection conferred by SAO, and erythrocyte invasion by *P. falciparum*.

D. Huertas, **A. Cortés**, J. Casanova & F. Azorín, **2004**, "*Drosophila* DDP1, a multi KH-domain protein, contributes to centromeric silencing and chromosome segregation", **Current Biology** 14:1611-20.

A. Benet, L. Tavul, J.C. Reeder & **A. Cortés**, 2004, "Diversity of the *Plasmodium falciparum* vaccine candidate Merozoite Surface Protein 4 (MSP4) in a natural population". *Mol. Biochem. Parasitol.* 134:275-80.

A. Cortés*, M. Mellombo, A. Benet, K. Lorry, L. Rare & J.C. Reeder, 2004, "*Plasmodium falciparum*: distribution of *msp2* genotypes among symptomatic and asymptomatic individuals from the Wosera region of Papua New Guinea". *Exp. Parasitol.* 106:22-9. *: corresponding author.

M. Kaestli, **A. Cortés**, M. Lagog, M. Ott & H.-P. Beck, 2004, "Longitudinal assessment of *Plasmodium falciparum* var gene transcription in naturally infected asymptomatic children in Papua New Guinea". *J. Infect. Dis.* 189:1942-51.

A. Cortés, I. Felger & H.-P. Beck, 2003, "Molecular Parasitology of Malaria in Papua New Guinea". REVIEW. *Trends Parasitol.* 19:246-9.

A. Cortés*, M. Mellombo, I. Mueller, A. Benet, J.C. Reeder & R.F. Anders, 2003, "Geographical structure of diversity and differences between symptomatic and asymptomatic infections for *Plasmodium falciparum* vaccine candidate AMA1". *Infect. Immun.* 71:1416-26. *: corresponding author.

In this article, we used population genetics and molecular epidemiology to gain important insights into the genetic diversity and selective forces in a leading malaria vaccine candidate.

A. Cortés, D. Huertas, F.X. Marsellach, N. Ferrer, M. Ortiz-Lombardia, L. Fanti, S. Pimpinelli, B. Piña & F. Azorín, 2003, REVIEW: "Analysing the contribution of nucleic acids to the structure and properties of centric heterochromatin", *Genetica* 117:117-25.

I. Mueller, J. Kaiok, J.C. Reeder & **A. Cortés**, 2002, "The population structure of *Plasmodium falciparum* and *Plasmodium vivax* during an epidemics of malaria in the Eastern Highlands of Papua New Guinea". *Am. J. Trop. Med. Hyg.* 67:459-64.

J. Cole-Tobian, **A. Cortés**, M. Baisor, W. Kastens, J. Xainli, M. Bockarie, J.H. Adams & C.L. King, 2002, "Age-acquired immunity to a *Plasmodium vivax* invasion ligand, the Duffy Binding Protein". *J. Infect. Dis.* 186:531-9.

A. Cortés & F. Azorín, 2000, "DDP1, a heterochromatin-associated multi-KH-domain protein of *Drosophila melanogaster*, interacts specifically with centromeric satellite DNA sequences". *Mol. Cell. Biol.* 20:3860-9.

A. Cortés, D. Huertas, L. Fanti, S. Pimpinelli, F.X. Marsellach, B. Piña & F. Azorín, 1999, "DDP-1, a single-stranded nucleic acid binding protein from *Drosophila*, associates with pericentric heterochromatin and is functionally homologous to the yeast Scp160p which is involved in the control of cell ploidy". *EMBO J.* 18:3820-33.

In this article, we identified, cloned, and extensively characterized a protein with unusual single-stranded nucleic acid binding properties. This protein plays an important role in nucleic acids biology.

M. Ortiz-Lombardía, **A. Cortés**, D. Huertas, R. Eritja & F. Azorín, 1998, "Tandem 5'-GA:GA-3' Missmatches Account for the High Stability of the Fold-back Structures Formed by the Centromeric *Drosophila* Dodeca-satellite". *J. Mol. Biol.* 277:757-62.

OTHER SCIENTIFIC CONTRIBUTIONS and OUTREACH ACTIVITIES (selection)

2022- Participation at the European Researcher's Night with a talk addressed to a general audience entitled: "Malària wars: el retorn del paràsit (cap al mosquit)". Cosmo Caixa, Barcelona.

2018- Posts at the ISGlobal 'Health is global' (<https://www.isglobal.org/en/healthisglobal>) and Nature Microbiology Community (<https://naturemicrobiologycommunity.nature.com>) blogs.

2016- Conference addressed to the general public as part of the "Pint of Science" international initiative (<https://pintofscience.com/>). Barcelona.

2013, 2014, 2015, 2017- Participation in the "Dia de la Ciència a les Escoles -Setmana de la Ciència" (Science Day at Schools, part of the Science Week organized by the Catalan Government): scientific conferences at secondary schools.

2015- Conference addressed to a non-scientific audience as part of the initiative "Ciència oberta al barri" (Science Opened to the Neighborhood), organized by Universitat de Barcelona.

2013- "Tight synchronization of *P. falciparum* asexual blood stages for transcriptional analysis", N. Rovira-Graells, V.M. Crowley and A. Cortés (in **Methods in Malaria Research** 6th Edition, 31-34, www.mr4.org/Publications/MethodsInMalariaResearch).

2012- Translation of the EVIMalaR Malaria Comic ("Malaria: the Battle against a Microscopic Killer") to Catalan Language (<http://www.malariacomix.com>).

MEDIA COVERAGE

The work from my group has attracted important attention from the media, including interviews for the main Spanish public TV channel (*TVE1*) and *COM* radio, among others, and articles or interviews in newspapers *Avui*, *El País*, *La Vanguardia*, *La Razón*, *ABC*, *El Mundo*, and *Ara* ("*Ara S*" recognition on 24th February 2014). At the international level, I was interviewed at several media including "*Organización de Estados Iberoamericanos*" (*OEI*) and *NTN24* (USA).