

2020

Annual Report



ehu group 

Achucarro

BASQUE CENTER FOR NEUROSCIENCE

scientia ad remedium

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FOREWORD

Dear reader,

The year 2020 has been marked by the **COVID-19 pandemic** which has changed our lives both at work and socially. Once the lockdown was lifted our managing team established a protocol with guidelines for returning progressively and safely to our onsite activities. These measures together with the collaboration of all colleagues have been instrumental to minimize the direct impact of the virus in our personnel as we had very few cases. Meanwhile, we have got used to online communication at all levels and maintained the high standards of our internal and external seminars.

Despite the limitations imposed by the pandemic to our experimental activities, the performance of our research groups in 2020 was excellent with 71 publications (85% in the first quartile), well above from the objectives set by our funders. In addition, 4 predoctoral researchers brilliantly completed their international PhD projects, and we continued our contribution to training undergraduate and master students by increasing the number of completed Graduate and Master Dissertations. Of note, our efforts and **commitment toward Equality have recognized by the Basque Institute for Women (Emakunde).**

Another hallmark of 2020 was **the renewal of the Scientific Directorate**. Late in 2019 I communicated to the Trustees my decision to step down from that position once we found a suitable replacement.

The search for new Director was managed by an external panel named by Ikerbasque and culminated with the appointment of **Ignacio Torres Alemán** who joined ACHUCARRO as Ikerbasque Research Professor in October and has taken over the Scientific Directorate as of January 1st, 2021. Dr. Torres Alemán has a remarkable scientific career studying the neurobiology of insulin peptides. In addition, he has a long experience as former Director of the Cajal Institute in Madrid.

In 2020, we succeeded in attracting competitive funding, including 6 projects from the framework programme of the Spanish Ministry of Science and Innovation. In addition, our colleague Mazahir T. Hasan leads a grant from the BRAIN Initiative to develop full-brain imaging genetic-technology at cellular resolution. This is the first project coordinated in our country, funded by this NIH programme.

This 2020 year marks the third year of our current Strategic Plan 2018-2021, and **we are proud to say that we achieved the strategic objectives set for this period**. The results and accomplishments in the 2020 report illustrate that **ACHUCARRO has created a unique international trademark in neurosciences and that we are prepared to face the challenges ahead**.

These excellent results are fruit of the continuous support of Ikerbasque - the Basque Foundation for Science and the University of the Basque Country (UPV/EHU). We want to acknowledge their commitment with us. **Eskerrik asko.**

Carlos Matute
Scientific Director

The Basque Government fostered the creation of the Basque Research Centre in the field of neuroscience within the network of Basque Excellence Research Centres (BERC) in 2012. The period from 2012 to 2017 was the initial establishment phase for our organisation. In 2018 we started our consolidation phase.

1. Strategy and Management

ACHUCARRO is part of the BERC (Basque Excellence Research Centres) network of the funded and supported by the Basque Government. There are currently 9 centres, and ACHUCARRO is the only one working in the field of neurobiology (there are 4 on physics/chemistry, 1 in biophysics, 1 in climate change, 1 in applied mathematics, and 1 in cognitive neuroscience and language). Three of them were created before 2007; other three in 2007, just after the creation of Ikerbasque, the Basque Foundation for Science; and the last three in 2012. ACHUCARRO is one of the three youngest centres of the network.

The Board of Trustees of ACHUCARRO is currently formed by representatives of Ikerbasque - the Basque Foundation for Science, the University of the Basque Country (UPV/EHU), and BIOEF – the Basque Foundation for Health Innovation and Research.

In the year 2018, we launched the deployment of our second strategic plan for the period 2018-2021. In this period, our main strategic objective is to consolidate the structure and the path established in the past, looking forward and adapting to the changing environment in scientific research within a global momentum of tremendous changes.

The foundations that support our strategic view and future vision are:

- ▶ Recruit, Reintegrate and Retain **talented research personnel**, to perform excellent research and contribute to the **advanced post-graduate training**.
- ▶ Develop **modern infrastructures** within the Science Park of the UPV/EHU, within the University campus in Leioa.
- ▶ Assess and incorporate the latest **technologies and equipment** to let the centre operate in the frontier of knowledge.
- ▶ To perform research projects centred in the study of glial cells to contribute to the discovery of **new therapies** for neurological diseases for the benefit and **well-being of the Society**.

We successfully passed the mid-term assessment of the BERC Programme, the fundamental funding scheme for ACHUCARRO.

Scientific Plan 2018–2021

The Mission of ACHUCARRO is to contribute to the development of a socially and economically sustainable society. We attain this shared challenge by performing high quality research in the field of neuron-glia biology and interactions, in the normal and pathological brain.

The Strategic Research Programme for this period, supervised and approved by our International Scientific Advisory Board and validated by our Board of Trustees, contains **three high-level research programmes:**

- ▶ **Characterization of the role of glial cells in the physiology of the nervous system**
 - roles of astrocytes in synaptic communication
 - neurotransmitter signalling during neurogenesis and gliogenesis
 - mechanisms of microglia phagocytosis during neurogenesis
- ▶ **Characterization of structural and functional changes of neuronal–glial networking in the aged brain**
 - age-dependent remodelling of neuronal–glial signalling
 - regulation of the intrinsic properties of neural stem cells in the adult hippocampus
- ▶ **The role of neuroglia in neurodegenerative diseases and other neurological disorders**
 - research on general mechanisms of neuron and glial cell death
 - understanding the pathophysiology of Alzheimer’s disease and epilepsy
 - autoimmune pathogenesis of multiple sclerosis (MS) and neuroinflammation

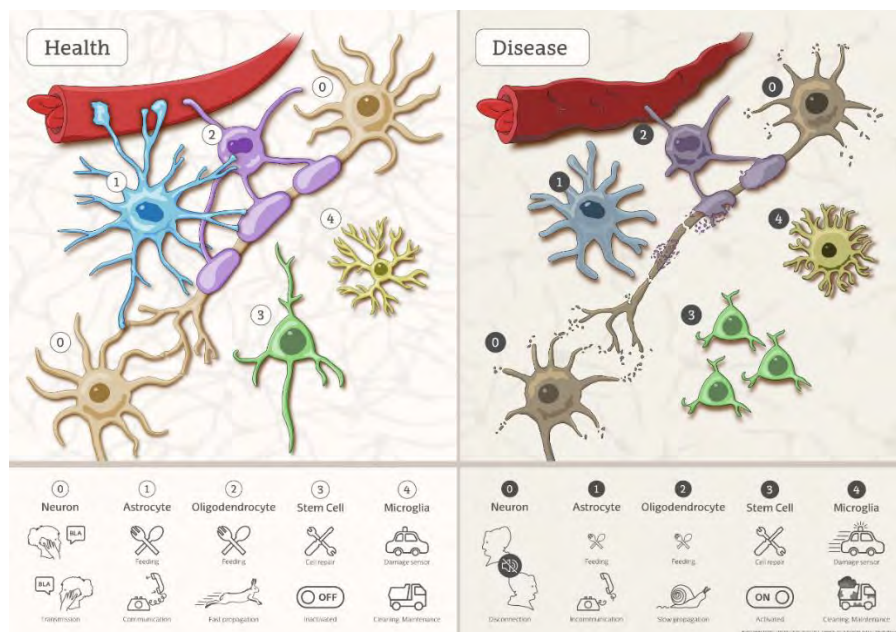


Figure 1. Schematics of our research focus

Equality Plan 2018-2021

In 2017, we underwent an internal analysis and reflection process to improve the policies and our organisational culture towards the Equality. The result of this process was the first **Achucarro Equality Plan, for the period 2018-2021**.

This first plan identifies four main areas of work to improve our commitment with equal opportunities:

1. Promoting equal opportunities in positions of responsibility
2. Generate working environments and conditions that facilitate the co-responsible conciliation of personal, family, and professional life
3. Incorporate the gender perspective in the policies, products, and operating dynamics
4. Promote inclusive leadership styles

The Plan launched in January 2018, being one of the first activities to appoint an **Equality Committee**, composed by representatives of personnel on different functions or career stages, from each gender.

One of the hallmarks of ACHUCARRO in 2020 was the recognition by Emakunde – the Basque Institute for Women, as one of the reference organisations in the Basque Country committed with Equality, being the first organisation of our sector achieving this award.



Figure 2. Evolution of number of Group Leader and Senior researchers by gender

<https://www.achucarro.org/equality>

Highlights in research outcomes

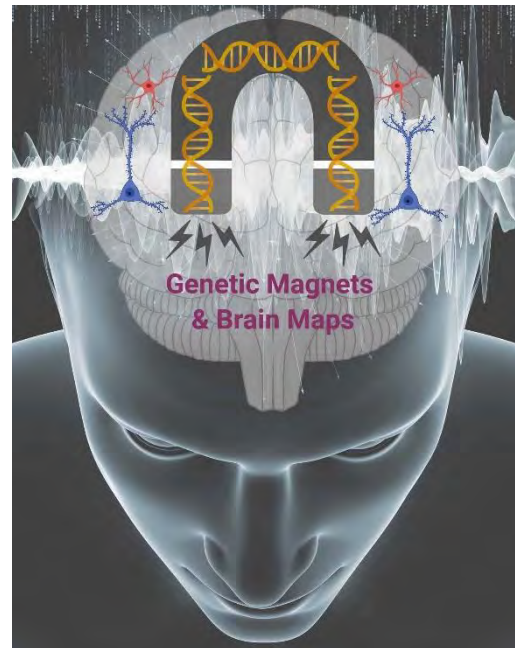
Ikerbasque Professor Dr. Mazahir T. Hasan achieved a highly competitive grant funded with 300.000 euros, by the prestigious "BRAIN Initiative" (USA). This grant is the first awarded of this programme to a research institution in Spain, as coordinator and host institution, and it is only the 10th grant awarded outside the USA since 2014, when the BRAIN Initiative was launched.

A novel genetic technology for functional mapping of the entire brain

The BRAIN Initiative, run by the National Institute of Health (USA), supports technology-driven innovative research projects that can have a transformational impact on unlocking some of the mysteries of the brain.

This two-year project aims to unveil novel genetic tools for full brain scale integrated activity mapping with MRI, using genetically-encoded magnetic indicators (GEMIs).

The project will foster a collaboration with other researchers and institutions within the Basque Science and Technology network, consolidating an interdisciplinary partnership that covers synthetic biology, MRI data acquisition and analyses.



To understand how the brain generates the different variety of neuro-biological phenomena, it is necessary to reveal the large-scale "activation patterns" of all brain circuits implied during learning, and their evolution in time while interacting with other circuits. New MRI-based technologies are needed to "directly" visualize cellular activity maps of the entire brain during learning experiences.



Mazahir T. Hasan

The importance that we confer to institutional relationships required a process to properly manage and maintain mutually beneficial partnerships. This process classifies the different types of collaborations, attending to the framework environment or the impact of each partnership in the development and achievement of our strategic objectives.

2. Partnerships and Collaborations

According to the objectives and fields of activity, we classify the collaboration and partnership relationships we create and maintain in three different types: Institutional, Strategic or Operational.

Institutional Alliances

We formalise institutional partnerships with specific written long-term agreements, which cover the terms of the collaboration. To some extent, such alliances are also strategic in nature, as indicated by the agreements signed with Ikerbasque and the UPV/EHU for the appointment of personnel.

These are our current institutional agreements by partner:

BASQUE GOVERNMENT

- Agreement to support the activities of the centre in the period 2018–2021
- Agreement to support the development of the Euro-Biolmaging node candidate in Bilbao

IKERBASQUE

- Framework Agreement for the appointment of research staff: Ikerbasque Research Professors, Associates and Fellows
- Specific agreements and annual protocols for the co-funding of Ikerbasque research staff

UNIVERSITY OF THE BASQUE COUNTRY (UPV/EHU)

- Framework Collaboration Agreement
- Specific agreement for the appointment of the Scientific Director
- Specific agreement for the appointment of teaching and research and personnel

BASQUE SCIENCE, TECHNOLOGY, AND INNOVATION NETWORK

- Attachment to this network and recognition in the “BERC - Basque Excellence Research Centre” category

Our strategic alliances are those organisations or individuals that allow us to extend our capabilities or complement our services.

Strategic Alliances



Bizkaia Talent

Established in 2005 with the support of the Provincial Council of Bizkaia, Bizkaia Talent is a non-profit organization that fosters and facilitates the attraction, connection, and retention of highly qualified professionals to the Basque Historic Territory of Bizkaia. Bizkaia Talent is a strategic partner and an ally of ACHUCARRO, which takes our name and objectives to the many international scientific events they attend, supporting our talent attraction process.



European Commission – HRS4R Community

Following our endorsement of the European Charter for Researchers fostered by the European Commission, we underwent the process of recognition of our internal policies for managing research personnel, according to HRS4R and OTM-R initiatives of the European Commission.



In 2020 we received renewed the **HR Excellence in Research** recognition awarded by the European Commission, after a fruitful site visit with experts from other European Institutions.

The International Scientific Advisory Committee is the main strategic advisory body of ACHUCARRO. Its primary role is to advise, supervise, and assess the objectives and performance of the different groups and professionals of the centre.

International Scientific Advisory Committee (ISAC)

The BERC centres, as many other organisations, in different sectors of activity, are required to have an advisory committee.

In our case, the International Scientific Advisory Committee is a panel of distinguished researchers in different areas of neuroscience that provide us with their view and opinion on the strategic and operational subjects for the better development of ACHUCARRO.



Figure 3. Members of the ISAC at the end of 2020

On March 12, the Directorate of our centre sent a message to all the staff, to order the immediate closure of the premises and the need to stop all the research work, accompanied by strict and painful measures: donation of sanitary and protection material, sacrifice of entire lines of experimental animals, and a lockdown.

Reaction to Covid-19 pandemic

Soon after the lockdown called by the authorities in our country, a group of scientists from various academic and research institutions like the UPV/EHU, Ikerbasque, ACHUCARRO, Biofisika Bizkaia Foundation, BioCruces Bizkaia and BioAraba Health Research Institutes, voluntarily and altruistically self-organised to set up an RT-PCR test for the detection of COVID-19 that would allow to increase the number of diagnostic tests.

In just 10 days of fine-tuning the protocols, the detection test has resulted in a specificity of 100% and a sensitivity of 92%. Sensitivity indicates the ability to detect positive cases, while specificity reflects how reliable the test is in giving non-infected people negative. The greatest advantage of this method is that it does not depend on commercial kits. These kits were scarce during the first months of the health emergency and pandemic situation.



Figure 5. The Basque Covid-19 task force, photo by Prof. Ugo Mayor (UPV/EHU, Ikerbasque)

***We are thankful
to the colleagues in ACHUCARRO
that devoted a lot of talent and personal effort
to make this possible***

Highlights in research outcomes

In the adult hippocampus, the majority of the new-born neurons undergo programmed death soon after they are born and are immediately engulfed and removed by microglia, through the process of phagocytosis. In this study, the authors have demonstrated that the genetic impairment of phagocytosis was accompanied by a neurogenesis reduction.

Life after (neuronal) death

Phagocytosis was in fact an extraordinarily active process that triggered a myriad of changes in microglia, from genes to metabolism. Some of these changes involved the secretome, the set of molecules released or secreted by phagocytic microglia, which contained signals that instructed new-born cells to multiply or differentiate into neurons. The secretome contained the signal between phagocytic microglia and the new-born neurons in the hippocampus and allowed closing the neuron's life cycle.

The article was showcased in the cover of the Journal of Neuroscience, the flagship journal of the American Society for Neuroscience. This study will help us understand how the brain fends for itself from the neuronal death that occurs during aging and neurodegenerative diseases such as Alzheimer's, Parkinson's, Stroke or Epilepsy. In these diseases, harnessing phagocytosis may serve as a new therapeutic strategy to accelerate debris removal and, in addition, to contribute to regenerate the damaged tissue through the phagocytic microglial secretome.



"Microglia Actively Remodel Adult Hippocampal Neurogenesis through the Phagocytosis Secretome"

Diaz-Aparicio, Irune; (...); Valero, Jorge; Sierra, Amanda

The Journal of Neuroscience (Feb-12) DOI: [10.1523/JNEUROSCI.0993-19.2019](https://doi.org/10.1523/JNEUROSCI.0993-19.2019)



We are an organisation of professionals from 14 different nationalities. Foreigners represent the 16% of the staff, and a contribution to diversity and internationalisation.

3. People

At the end of 2020, ACHUCARRO was an organisation of 107 people.

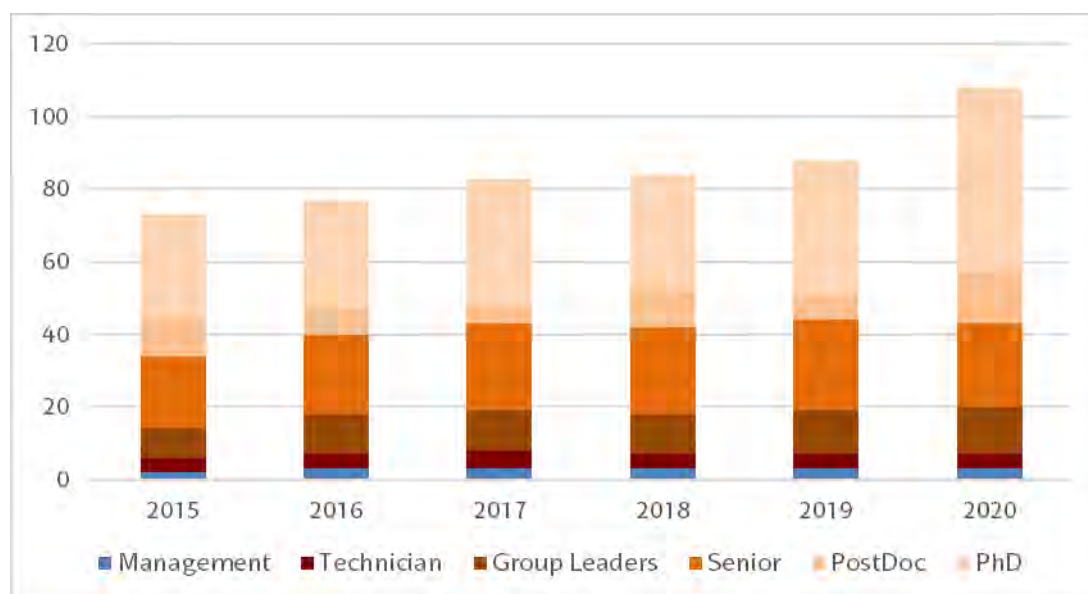


Figure 4. Evolution of personnel 2015-2020

Some of our colleagues (9) finished their projects, stays or appointments during 2020.

Even if 2020 was a year marked by the consequences of SARS-CoV-2, our staff increased by 23%. This growth is based on the appointment of new contracts of research personnel, funded with grant, corresponding to the 41% of the research staff.

Colleagues finishing their appointment this year

Eva **Benito** (Senior Researcher) Juan **Echevarria** (Project Manager) Marian **Fernández** (Management Assistant) Francisco **Llavero** (Postdoctoral Fellow) Saioa **Marcos** (Technician) Soraya **Martín** (Postdoctoral Fellow) Oier **Pastor** (Predoctoral researcher) Paula **Ramos** (Predoctoral researcher) María Paz **Serrano** (Postdoctoral Fellow)

Appointed Staff (December 2020)

Oihane **Abiega** (Postdoctoral Fellow) Svein **Achicallende** (Predoctoral researcher) Elena **Alberdi** (Senior Researcher) María **Alfonso** (Predoctoral researcher) Saioa **Alzola** (Predoctoral researcher) María **Ardaya** (Predoctoral researcher) Amaia **Arranz** (Group Leader) Alazne **Arrazola** (Predoctoral researcher) Elsa **Astorga** (Predoctoral researcher) Uxue **Balantzategi** (Predoctoral researcher) Jimena **Baleriola** (Group Leader) Laura **Bayón** (Predoctoral researcher) Sol **Beccari** (Predoctoral researcher) Ana **Bernal** (Postdoctoral Fellow) Maite **Blanco** (Predoctoral researcher) Eleanora **Blasi** (Predoctoral researcher) Itziar **Bonilla** (Predoctoral researcher) Leire **Boveda** (Predoctoral researcher) Ianire **Buceta** (Senior Researcher) Estibaliz **Capetillo** (Senior Researcher) Alejandro **Carretero** (Postdoctoral Fellow) Fabio **Cavaliere** (Senior Researcher) Juan Carlos **Chara** (Postdoctoral Fellow) Raffaella **Cipriani** (Technician) Teresa **Colomer** (Predoctoral researcher) Joan **Cruz** (Predoctoral researcher) Joanna **Danielewicz** (Postdoctoral Fellow) Aida **de la Cruz** (Predoctoral researcher) María **Domercq** (Senior Researcher) Irene **Durá** (Predoctoral researcher) Jon **Egaña** (Postdoctoral Fellow) Izaskun **Elezgarai** (Senior Researcher) Juan Manuel **Encinas** (Group Leader) Laura **Escobar** (Technician) María **Gamarra** (Predoctoral researcher) Adhara **Gaminde** (Predoctoral researcher) Laura **García** (Project Manager) Fernando **García-Moreno** (Senior Researcher) Lorena **García** (Predoctoral researcher) Inmaculada **Gerrikagoitia** (Senior Researcher) Paula **Gimenez** (Predoctoral researcher) Sonia **Gómez** (Senior Researcher) Pedro **Grandes** (Group Leader) Juan Jose **Gutierrez** (Predoctoral researcher) Mazahir T. **Hasan** (Group Leader) María Isabel **Hernández** (Predoctoral researcher) Izaskun **Igeregi** (Management Assistant) Leire **Iglesias** (Lab Technician) Leire **Izagirre** (Predoctoral researcher) Ana **Joya** (Predoctoral researcher) Maria **Kukley** (Group Leader) Begüm **Kurt** (Predoctoral researcher) Rizky **Lasabuda** (Predoctoral researcher) Leire **Lekunberri** (Predoctoral researcher) Alice **Louail** (Postdoctoral Fellow) Celia **Luchena** (Predoctoral researcher) Miriam **Luque** (Predoctoral researcher) Mar **Márquez** (Predoctoral researcher) Zara **Martínez** (Technician) Abraham **Martín** (Group Leader) Susana **Mato** (Senior Researcher) Carlos **Matute** (Scientific Director) Juan **Mendizabal** (Senior Researcher) Amaia **Mimenza** (Predoctoral researcher) Alejandro **Montilla** (Predoctoral researcher) Alvaro **Moreno** (Predoctoral researcher) Teresa **Muro** (Predoctoral researcher) Ana **Palma** (Predoctoral researcher) Aitor **Palomino** (Facility Manager) Olatz **Pampliega** (Group Leader) Iñaki **Paris** (Predoctoral researcher) Marta **Pereira** (Predoctoral researcher) Fernando **Pérez-Cerdá** (Senior Researcher) Lucila **Pérez** (Predoctoral researcher) Alberto **Pérez-Samartín** (Senior Researcher) José Ramón **Pineda** (Senior Researcher) Ainhoa **Plaza** (Postdoctoral Fellow) Nagore **Puente** (Senior Researcher) Almudena **Ramos** (Senior Researcher) Leire **Reguero** (Senior Researcher) Irantzu **Rico** (Senior Researcher) Noelia **Rodriguez** (Predoctoral researcher) Ane **Rodriguez** (Predoctoral researcher) Eneritz **Rueda** (Predoctoral researcher) Asier **Ruiz** (Senior Researcher) Jaime **Sagarduy** (General Manager) Gentzane **Sánchez** (Postdoctoral Fellow) María Victoria **Sánchez-Gómez** (Senior Researcher) Rafael **Sarría** (Senior Researcher) Rodrigo **Senovilla** (Predoctoral researcher) Maitane **Serrano** (Predoctoral researcher) Virginia **Sierra** (Predoctoral researcher) Amanda **Sierra** (Group Leader) Edgar **Soria** (Senior Researcher) Federico N. **Soria** (Senior Researcher) Vanja **Tepavcevic** (Senior Researcher) Itziar **Terradillos** (Predoctoral researcher) Irene **Tomé** (Predoctoral researcher) Jan **Tønnesen** (Group Leader) Ignacio **Torres** (Group Leader) Jorge **Valero** (Senior Researcher) Maria **Vella** (Predoctoral researcher) Alexei **Verkhatsky** (Group Leader) Fátima **Zallo** (Postdoctoral Fellow) Jonathan **Zegarra** (Predoctoral researcher) Jone **Zuazo** (Predoctoral researcher) José Luis **Zugaza** (Group Leader)

Open, Transparent, Merit-based Recruitment

The Board of Trustees and the Direction of ACHUCARRO endorsed the **European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers** fostered by the European Commission as the first decision of the first meeting of Trustees in 2012.

This decision led to a mandate to start an internal assessment process to define and improve the policies to attract, retain and support the development of careers of the research personnel of the centre.

In September 2013, the European Commission awarded us with the **HR Excellence in Research** recognition to our commitment with the *European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers*, and the rest of the recommendations (OTM-R) set by the Human Resources Strategy for Research (HRS4R) working group.



In the last quarter of 2019, we underwent a new self-assessment process and concluded in a report submitted to the European Commission, and the consequent site visit, by a panel of three external experts in the HRS4R strategy.

The outcome of this process was excellent, as we renewed the “HR Excellence in Research” recognition, and the whole process helped identifying interesting improvement areas and ideas that we added to our Action Plan from the next period.

More information about this strategy and actions are available at the website:

<https://www.achucarro.org/hrs4r>

ACHUCARRO contributed with 71 new publications in 2020.

85% of them in the first quartiles of their research fields.

4. Research

These are the laboratories and their group leaders at the end of 2020:

Research Groups

*Laboratory of
Humanized Models
of Disease*



Amaia Arranz
Ikerbasque Research Fellow

*Laboratory of
Local Translation in
Neurons and Glia*



Jimena Baleriola
Ramón y Cajal Fellow

*Laboratory of
Neural Stem Cells
and Neurogenesis*



Juan Manuel Encinas
Ikerbasque Research Professor

*Laboratory of
Ultrastructural and
Functional
Neuroanatomy of
the Synapse*



Pedro Grandes
Full Professor
Department of Neurosciences
(UPV/EHU)

*Laboratory of
Brain Circuits
Therapeutics*



Mazahir T. Hasan
Ikerbasque Research Professor

*Laboratory of
Neuronal and Glial
Physiology*



Maria Kukley
Ikerbasque Research Professor

*Laboratory of
Neuroimaging and
biomarkers of
inflammation*



Abraham Martín
Ramón y Cajal Fellow

*Laboratory of
Neurobiology*



Carlos Matute
Full Professor
Department of Neurosciences
(UPV/EHU)

*Laboratory of
Glial and Neuronal
Autophagy*



Olatz Pampliega
Ramón y Cajal Fellow

*Laboratory of
Glial Cell Biology*



Amanda Sierra
Ikerbasque Research Professor

*Laboratory of
Neuronal
Excitability*



Jan Tønnesen
Ramón y Cajal Fellow

*Laboratory of
Neurobiology of
Insulin Peptides*



Ignacio Torres Alemán
Ikerbasque Research Professor

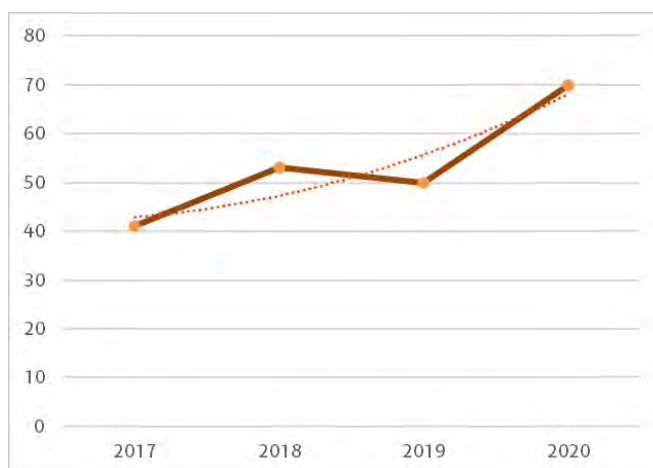
*Laboratory of
GTPases and
Neurosignalling*



Jose Luis Zugaza
Ikerbasque Research Professor

Some output indicators

► Publications

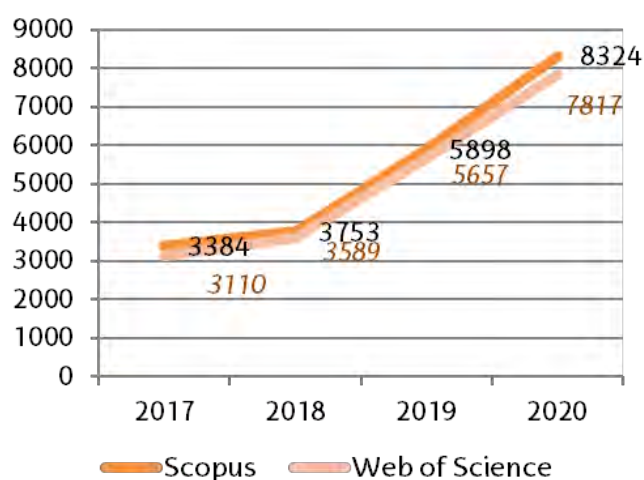


In the year 2020, we published a total of 71 research articles.

This means 40% more papers than in 2019.

It has been shown that the situation caused by the pandemic has increased the publication of scientific works.

► Citations



Our publications have received more than 8.000 cites (excluding self-cites) according to Scopus and Web of Science.

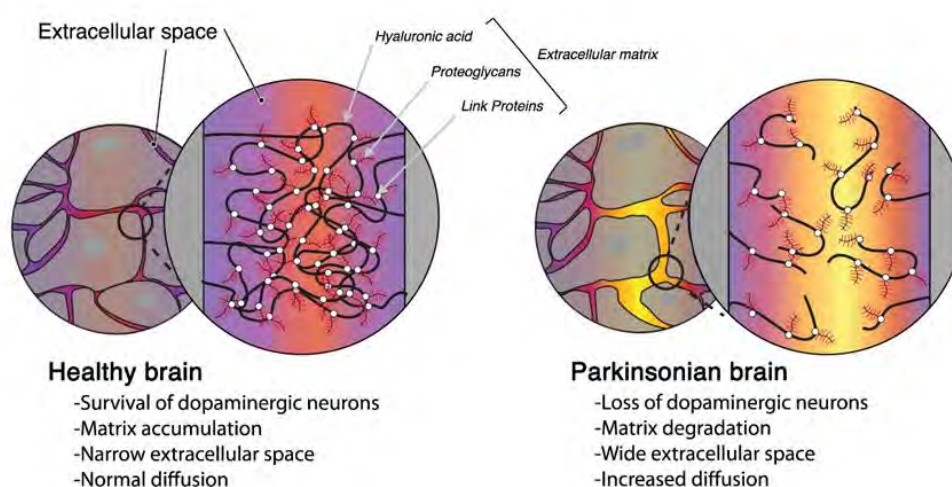
This represents a mean of 38 cites per paper, in the period 2017-2020.

Highlights in research outcomes

The extracellular space (ECS) is a dynamic compartment where molecules travel mostly by diffusion. It holds a dynamic scaffold known as the extracellular matrix, which in the brain is mostly composed by hyaluronan, a versatile polymer with structural and signalling properties. The ECS, with its nanometric width, has been a black box until the recent development of super-resolution imaging. Whether the ECS and its associated extracellular microenvironment are altered in brain pathology, is still unknown.

Illuminating the dark side of the brain in neurodegeneration

Federico N. Soria and colleagues from Bordeaux Neurocampus set out to explore the extracellular microenvironment in neurodegeneration. They injected Lewy body (LB) fractions from Parkinson's disease patients to trigger synucleinopathy in mice. Cryofixation-EM, which provides more accurate images of the ECS than conventional electron microscopy, showed that neurodegeneration alters ECS local width, and hence how the ECS is spatially distributed. In live brain, using single-nanotube tracking coupled to super-resolution image analysis, the authors corroborated the enlarged widths in the parkinsonian ECS, and found increased diffusion alongside a disrupted hyaluronan matrix. The article also describes an intriguing relation between the extracellular matrix and glia. In particular, how hyaluronan is fragmented in neurodegeneration, activating microglia, and how these cells remodel the extracellular matrix by phagocytosis, creating a bidirectional loop in the pathological brain.



"Synucleinopathy alters nanoscale organization and diffusion in the brain extracellular space through hyaluronan remodeling" Nat Commun 11, 3440 (2020).

Soria, F.N., Paviolo, C., Doudnikoff, E. et al.

Nature Communications (Jul-10) DOI: [10.1038/s41467-020-17328-9](https://doi.org/10.1038/s41467-020-17328-9)



Publications

1. **A Novel Cortical Mechanism for Top-Down Control of Water Intake**
Zhao, Zhe; Soria-Gómez, Edgar; Varilh, Marjorie; Covelo, Ana; Julio-Kalajzi, Francisca; Cannich, Astrid; Castiglione, Adriana; Vanhoutte, Léonie; Duveau, Alexia; Zizzari, Philippe; Beyeler, Anna; Cota, Daniela; Bellocchio, Luigi; Busquets-Garcia, Arnau; Marsicano, Giovanni
Current Biology (Dec-07) DOI: 10.1016/j.cub.2020.09.011
2. **In search of common developmental and evolutionary origin of the claustrum and subplate**
Bruguier, Hannah; Suarez, Rodrigo; Manger, Paul; Hoerder Suabedissen, Anna; Shelton, Andrew M.; Oliver, David K.; Packer, Adam M.; Ferran, José L.; García Moreno, Fernando; Puellas, Luis; Molnár, Zoltán
Journal of Comparative Neurology (Dec-01) DOI: 10.1002/cne.24922
3. **Neuropathobiology of COVID-19: The Role for Glia**
Tremblay, M.-E.; Madore, C.; Bordeleau, M.; Tian, L.; Verkhatsky, A.
Frontiers in Cellular Neuroscience (Dec-01) DOI: 10.3389/fncel.2020.592214
4. **Essential omega-3 fatty acids tune microglial phagocytosis of synaptic elements in the mouse developing brain**
Madore, C.; Leyrolle, Q.; Morel, L.; Rossitto, M.; Greenhalgh, A. D.; Delpech, J. C.; Martinat, M.; Bosch-Bouju, C.; Bourel, J.; Rani, B.; Lacabanne, C.; Thomazeau, A.; Hopperton, K. E.; Beccari, S.; Sere, A.; Aubert, A.; De Smedt-Peyrusse, V.; Lecours, C.; Bisht, K.; Fourgeaud, L.; Gregoire, S.; Bretillon, L.; Acar, N.; Grant, N. J.; Badaut, J.; Gressens, P.; Sierra, A.; Butovsky, O.; Tremblay, M. E.; Bazinet, R. P.; Joffre, C.; Nadjar, A.; Layé, S.
Nature Communications (Nov-30) DOI: 10.1038/s41467-020-19861-z
5. **Can COVID-19 pandemic boost the epidemic of neurodegenerative diseases?**
Verkhatsky, Alexei; Li, Qing; Melino, Sonia; Melino, Gerry; Shi, Yufang
Biology Direct (Nov-27) DOI: 10.1186/s13062-020-00282-3
6. **(Review) Is there such a thing as a genuine cancer stem cell marker? Perspectives from the gut, the brain and the dental pulp**
Crende, O.; García-Gallastegui, P.; Luzuriaga, J.; Badiola, I.; de la Hoz, C.; Unda, F.; Ibarretxe, G.; Pineda, J.R.
Biology (Nov-27) DOI: 10.3390/biology9120426
7. **Untangling Complexities of Glial-Neuronal Communications: Astroglial Metabolic Cascades Orchestrate Tonic Inhibition in the Thalamus**
Verkhatsky, Alexei
Neuron (Nov-25) DOI: 10.1016/j.neuron.2020.10.025
8. **Variations of telencephalic development that paved the way for neocortical evolution**
García-Moreno, Fernando; Molnár, Zoltán
Progress in Neurobiology (Nov-15) DOI: 10.1016/j.pneurobio.2020.101865
9. **(Review) Astroglia-specific contributions to the regulation of synapses, cognition and behaviour**
Augusto-Oliveira, Marcus; Arrifano, Gabriela P.; Takeda, Priscila Y.; Lopes-Araújo, Amanda; Santos-Sacramento, Leticia; Anthony, Daniel C.; Verkhatsky, Alexei; Crespo-Lopez, Maria Elena
Neuroscience & Biobehavioral Reviews (Nov-15) DOI: 10.1016/j.neubiorev.2020.07.039

10. **P2X7 Receptor-Dependent Layer-Specific Changes in Neuron-Microglia Reactivity in the Prefrontal Cortex of a Phencyclidine Induced Mouse Model of Schizophrenia**
Calovi, Stefano; Mut-Arbona, Paula; Tod, Pál; Iring, András; Nicke, Annette; Mato, Susana; Vizi, E. Sylvester; Tønnesen, Jan; Sperlagh, Beata
Frontiers in Molecular Neuroscience (Nov-11) DOI: 10.3389/fnmol.2020.566251
11. **Vasculogenesis from Human Dental Pulp Stem Cells Grown in Matrigel with Fully Defined Serum-Free Culture Media**
Luzuriaga, Jon; Irurzun, Jon; Irastorza, Igor; Unda, Fernando; Ibarretxe, Gaskon; Pineda, Jose R.
Biomedicines (Nov-05) DOI: 10.3390/biomedicines8110483
12. **The HIF1 /JMY pathway promotes glioblastoma stem-like cell invasiveness after irradiation**
Gauthier, Laurent R.; Saati, Mahasen; Bensalah-Pigeon, Hayet; Ben M'Barek, Karim; Gitton-Quent, Oscar; Bertrand, Romane; Busso, Didier; Mouthon, Marc-André; Collura, Ada; Junier, Marie-Pierre; Chneiweiss, Hervé; Pineda, José R.; Boussin, François D.
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13. **Current Techniques for Investigating the Brain Extracellular Space**
Soria, Federico N.; Miguelez, Cristina; Peñagarikano, Olga and Tønnesen, Jan
Frontiers in Neuroscience (Oct-14) DOI: 10.3389/fnins.2020.570750
14. **(Review) Neurobiological Mechanisms of Autism Spectrum Disorder and Epilepsy, Insights from Animal Models**
Sierra-Arregui, Teresa; Llorente, Javier; Giménez Minguez, Paula; Tønnesen, Jan; Peñagarikano, Olga
Neuroscience (Oct-01) DOI: 10.1016/j.neuroscience.2020.02.043
15. **Disruption of oligodendrocyte progenitor cells is an early sign of pathology in the triple transgenic mouse model of Alzheimer's disease**
Vanzulli, Ilaria; Papanikolaou, Maria; De La Rocha, Irene Chacon; Pieropan, Francesca; Rivera, Andrea D.; Gomez-Nicola, Diego; Verkhratsky, Alexei; Rodríguez, José Julio; Butt, Arthur M.
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Bengoa-Vergniory, Nora; Faggiani, Emilie; Ramos-Gonzalez, Paula; Kirkiz, Ecem; Connor-Robson, Natalie; Brown, Liam V.; Siddique, Ibrar; Li, Zizheng; Vingill, Siv; Cioroch, Milena; Cavaliere, Fabio; Threlfell, Sarah; Roberts, Bradley; Schrader, Thomas; Klärner, Frank-Gerrit; Cragg, Stephanie; Dehay, Benjamin; Bitan, Gal; Matute, Carlos; Bezard, Erwan; Wade-Martins, Richard
Nature Communications (Sep-28) DOI: 10.1038/s41467-020-18689-x
17. **(Review) Astroglial asthenia and loss of function, rather than reactivity, contribute to the ageing of the brain**
Verkhratsky, Alexei; Augusto-Oliveira, Marcus; Pivori nas, Augustas; Popov, Alexander; Brazhe, Alexey; Semyanov, Alexey
Pflügers Archiv - European Journal of Physiology (Sep-26) DOI: 10.1007/s00424-020-02465-3
18. **Microglial phagocytosis dysfunction in the dentate gyrus is related to local neuronal activity in a genetic model of epilepsy**
Sierra Torre, Virginia; Plaza Zabala, Ainhoa; Bonifazi, Paolo; Abiega, Oihane; Díaz Aparicio, Irune; Tegelberg, Saara; Lehesjoki, Anna-Elina; Valero, Jorge; Sierra, Amanda
Epilepsia (Sep-17) DOI: 10.1111/epi.16692
19. **Mitochondrial division inhibitor 1 disrupts oligodendrocyte Ca²⁺ homeostasis and mitochondrial function**
Ruiz, Asier; Quintela López, Tania; Sánchez Gómez, María V.; Gaminde Blasco, Adhara; Alberdi, Elena; Matute, Carlos
Glia (Sep-15) DOI: 10.1002/glia.23802

20. **Overexpression of α -Synuclein Reorganises Growth Factor Profile of Human Astrocytes**
engül, Bü rre; Dursun, Erdinç; Verkhatsky, Alexei; Gezen-Ak, Duygu
Molecular Neurobiology (Sep-10) DOI: 10.1007/s12035-020-02114-x
21. **Physiology of astroglial excitability**
Verkhatsky, Alexei; Semyanov, Alexey; Zorec, Robert
Function (Sep-04) DOI: 10.1093/function/zqaa016
22. **(Review) Small GTPases of the Ras and Rho Families Switch on/off Signaling Pathways in Neurodegenerative Diseases**
Arrazola Sastre, A.; Luque Montoro, M.; Gálvez-Martín, P.; Lacerda, H.M.; Lucia, A.M.; Llaveró, F.; Zugaza, J.L.
International journal of molecular sciences (Aug-31) DOI: 10.3390/ijms21176312
23. **Gene Expression Analysis of Astrocyte and Microglia Endocannabinoid Signaling during Autoimmune Demyelination**
Moreno-García, Álvaro; Bernal-Chico, Ana; Colomer, Teresa; Rodríguez-Antigüedad, Alfredo; Matute, Carlos; Mato, Susana
Biomolecules (Aug-24) DOI: 10.3390/biom10091228
24. **Sephin1 protects neurons against excitotoxicity independently of the integrated stress response**
Ruiz, A.; Zuazo, J.; Ortiz-Sanz, C.; Luchena, C.; Matute, C.; Alberdi, E.
International Journal of Molecular Sciences (Aug-24) DOI: 10.3390/ijms21176088
25. **Expression and Function of GABA Receptors in Myelinating Cells**
Serrano-Regal, M.P.; Bayón-Cordero, L.; Ordaz, R.P.; Garay, E.; Limón, A.; Arellano, R.O.; Matute, C.; Sánchez-Gómez, M.V.
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26. **Specific Hippocampal Interneurons Shape Consolidation of Recognition Memory**
Cruz, Jose F. Oliveira da; Busquets-Garcia, Arnau; Zhao, Zhe; Varilh, Marjorie; Lavanço, Gianluca; Bellocchio, Luigi; Robin, Laurie; Cannich, Astrid; Julio-Kalajzi, Francisca; Lesté-Lasserre, Thierry; Maître, Marlène; Drago, Filippo; Marsicano, Giovanni; Soria-Gómez, Edgar
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27. **Exocytosis of large-diameter lysosomes mediates interferon γ -induced relocation of MHC class II molecules toward the surface of astrocytes**
Bo i, Mi o; Verkhatsky, Alexei; Zorec, Robert; Stenovec, Matja
Cellular and Molecular Life Sciences (Aug-15) DOI: 10.1007/s00018-019-03350-8
28. **Astrocytes in rapid ketamine antidepressant action**
Stenovec, Matja ; Li, Baoman; Verkhatsky, Alexei; Zorec, Robert
Neuropharmacology (Aug-15) DOI: 10.1016/j.neuropharm.2020.108158
29. **Lysophosphatidic Acid Receptor 1 Specifically Labels Seizure-Induced Hippocampal Reactive Neural Stem Cells and Regulates Their Division**
Valcárcel-Martín, Roberto; Martín-Suárez, Soraya; Muro-García, Teresa; Pastor-Alonso, Oier; Rodríguez de Fonseca, Fernando; Estivil-Torrús, Guillermo; Encinas, Juan Manuel
Frontiers in Neuroscience (Aug-14) DOI: 10.3389/fnins.2020.00811
30. **Contribution of p2x4 receptors to cns function and pathophysiology**
Montilla, A.; Mata, G.P.; Matute, C.; Domercq, M.
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31. **Chronic hyperglycemia impairs hippocampal neurogenesis and memory in an Alzheimer's disease mouse model**
 Ferreira, Elisabete; Lanzillo, Mariagrazia; Canhoto, Diogo; Carvalho da Silva, António M.; Mota, Sandra I.; Dias, Inês S.; Ferreira, Ildete L.; Fontes, Ana R.; Mastrella, Giorgia; Pinheiro, Paulo; Valero, Jorge; Rego, A. Cristina
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32. **(Review) Psychiatric face of COVID-19**
 Steardo, Luca; Steardo, Luca; Verkhatsky, Alexei
Translational Psychiatry (Jul-30) DOI: 10.1038/s41398-020-00949-5
33. **Predicting susceptibility and resilience in an animal model of post-traumatic stress disorder (PTSD)**
 Colucci, Paola; Marchetta, Enrico; Mancini, Giulia Federica; Alva, Phoebe; Chiarotti, Flavia; Hasan, Mazahir T.; Campolongo, Patrizia
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34. **Alterations of the Hippocampal Neurogenic Niche in a Mouse Model of Dravet Syndrome**
 Martín-Suárez, Soraya; Abiega, Oihane; Ricobaraza, Ana; Hernandez-Alcoceba, Rubén; Encinas, Juan Manuel
Frontiers in Cell and Developmental Biology (Jul-21) DOI: 10.3389/fcell.2020.00654
35. **Oligodendrocyte Differentiation and Myelination Is Potentiated via GABAB Receptor Activation**
 Serrano-Regal, Mari Paz; Luengas-Escuza, Irene; Bayón-Cordero, Laura; Ibarra-Aizpurua, Naroa; Alberdi, Elena; Pérez-Samartín, Alberto; Matute, Carlos; Sánchez-Gómez, María Victoria
Neuroscience (Jul-15) DOI: 10.1016/j.neuroscience.2019.07.014
36. **An overview of international regulatory frameworks for mesenchymal stromal cell-based medicinal products: From laboratory to patient**
 López Beas, Javier; Guadix, Juan A.; Clares, Beatriz; Soriano Ruiz, Jose L.; Zugaza, José L.; Gálvez Martín, Patricia
Medicinal Research Reviews (Jul-15) DOI: 10.1002/med.21659
37. **Neuroinfection may potentially contribute to pathophysiology and clinical manifestations of COVID-19**
 Steardo, Luca; Steardo, Luca; Zorec, Robert; Verkhatsky, Alexei
Acta Physiologica (Jul-15) DOI: 10.1111/apha.13473
38. **In vivo PET Imaging of Gliogenesis After Cerebral Ischemia in Rats**
 Ardaya, M.; Joya, A.; Padro, D.; Plaza-García, S.; Gómez-Vallejo, V.; Sánchez, M.; Garbizu, M.; Cossío, U.; Matute, C.; Cavaliere, F.; Llop, J.; Martín, A.
Frontiers in Neuroscience (Jul-15) DOI: 10.3389/fnins.2020.00793
39. **Synucleinopathy alters nanoscale organization and diffusion in the brain extracellular space through hyaluronan remodeling**
 Soria, Federico N.; Paviolo, Chiara; Doudnikoff, Evelyn; Arotcarena, Marie-Laure; Lee, Antony; Danné, Noémie; Mandal, Amit Kumar; Gosset, Philippe; Dehay, Benjamin; Groc, Laurent; Cognet, Laurent; Bezard, Erwan
Nature Communications (Jul-10) DOI: 10.1038/s41467-020-17328-9
40. **Glucose metabolism links astroglial mitochondria to cannabinoid effects**
 Jimenez-Blasco, Daniel; Busquets-Garcia, Arnau; Hebert-Chatelain, Etienne; Serrat, Roman; Vicente-Gutierrez, Carlos; Ioannidou, Christina; Gómez-Sotres, Paula; Lopez-Fabuel, Irene; Resch-Beusher, Monica; Resel, Eva; Arnouil, Dorian; Saraswat, Dave; Varilh, Marjorie; Cannich, Astrid; Julio-Kalajic, Francisca; Bonilla-Del Río, Itziar; Almeida, Angeles; Puente, Nagore; Achicallende, Svein; Lopez-Rodriguez, Maria-Luz; Jollé, Charlotte; Déglon, Nicole; Pellerin, Luc; Josephine, Charlene; Bonvento, Gilles; Panatier, Aude; Lutz, Beat; Piazza, Pier-Vincenzo; Guzmán, Manuel; Bellocchio, Luigi; Bouzier-Sore, Anne-Karine; Grandes, Pedro; Bolaños, Juan P.; Marsicano, Giovanni
Nature (Jul-08) DOI: 10.1038/s41586-020-2470-y

41. **Large-Scale Proteomics Highlights Glial Role in Neurodegeneration**
Verkhatsky, Alexei; Zorec, Robert
Cell Metabolism (Jul-07) DOI: 10.1016/j.cmet.2020.06.001
42. **Iron Aggravates the Depressive Phenotype of Stressed Mice by Compromising the Glymphatic System**
Liang, Shanshan; Lu, Yan; Li, Zexiong; Li, Shuai; Chen, Beina; Zhang, Manman; Chen, Binjie; Ji, Ming; Gong, Wenliang; Xia, Maosheng; Verkhatsky, Alexei; Wu, Xu; Li, Baoman
Neuroscience Bulletin (Jun-24) DOI: 10.1007/s12264-020-00539-x
43. **LUZP1, a novel regulator of primary cilia and the actin cytoskeleton, is a contributing factor in Townes-Brocks Syndrome**
Bozal-Basterra, Laura; Gonzalez-Santamarta, María; Muratore, Veronica; Bermejo-Arteagabeitia, Aitor; Da Fonseca, Carolina; Barroso-Gomila, Orhi; Azkargorta, Mikel; Iloro, Ibon; Pampliega, Olatz; Andrade, Ricardo; Martín-Martín, Natalia; Branon, Tess C; Ting, Alice Y; Rodríguez, Jose A; Carracedo, Arkaitz; Elortza, Felix; Sutherland, James D; Barrio, Rosa
eLife (Jun-18) DOI: 10.7554/eLife.55957
44. **(Review) P2X7 Receptors as a Therapeutic Target in Cerebrovascular Diseases**
Cisneros-Mejorado, Abraham J.; Pérez-Samartín, Alberto; Domercq, María; Arellano, Rogelio O.; Gottlieb, Miroslav; Koch-Nolte, Friedrich; Matute, Carlos
Frontiers in Molecular Neuroscience (Jun-18) DOI: 10.3389/fnmol.2020.00092
45. **(Editorial) Olfaction: From Genes to Behavior**
Soria-Gómez, Edgar
Genes (Jun-15) DOI: 10.3390/genes11060654
46. **Spinal Cord Injury Leads to Hippocampal Glial Alterations and Neural Stem Cell Inactivation**
Jure, Ignacio; De Nicola, Alejandro F.; Encinas, Juan Manuel; Labombarda, Florencia
Cellular and Molecular Neurobiology (Jun-14) DOI: 10.1007/s10571-020-00900-8
47. **An Overground Robotic Gait Training Program for People With Multiple Sclerosis: A Protocol for a Randomized Clinical Trial**
Berriozabalgoitia, Rakel; Sanz, Begoña; Fraile-Bermúdez, Ana Belén; Otxoa, Erika; Yeregui, Izaskun; Bidaurreazaga-Letona, Iraia; Duñabeitia, Iratxe; Antigüedad, Alfredo; Domercq, Maria; Irazusta, Jon; Rodríguez-Larrad, Ana
Frontiers in Medicine (Jun-09) DOI: 10.3389/fmed.2020.00238
48. **Object-Based Analyses in FIJI/ImageJ to Measure Local RNA Translation Sites in Neurites in Response to A β 1-42 Oligomers**
Gamarra, María; Blanco-Urrejola, Maite; Batista, Andreia F. R.; Imaz, Josune; Baleriola, Jimena
Frontiers in Neuroscience (Jun-03) DOI: 10.3389/fnins.2020.00547
49. **Immortalised Hippocampal Astrocytes from 3xTG-AD Mice Fail to Support BBB Integrity In Vitro: Role of Extracellular Vesicles in Glial-Endothelial Communication**
Kriauškaitė, R.; Kaur, A.; Pajarskienė, J.; Tunaitis, V.; Lim, D.; Verkhatsky, A.; Pivorišius, A.
Cellular and Molecular Neurobiology (May-22) DOI: 10.1007/s10571-020-00871-w
50. **A Clonal NG2-Glia Cell Response in a Mouse Model of Multiple Sclerosis**
Barriola, Sonsoles; Pérez-Cerdá, Fernando; Matute, Carlos; Bribián, Ana; López-Mascaraque, Laura
Cells (May-21) DOI: 10.3390/cells9051279
51. **Loss of Dmrt5 Affects the Formation of the Subplate and Early Corticogenesis**
Ratié, Leslie; Desmaris, Elodie; García-Moreno, Fernando; Hoerder-Suabedissen, Anna; Kelman, Alexandra; Theil, Thomas; Bellefroid, Eric J.; Molnár, Zoltán
Cerebral Cortex (May-14) DOI: 10.1093/cercor/bhz310

52. **Multipurpose Na⁺ ions mediate excitation and cellular homeostasis: Evolution of the concept of Na⁺ pumps and Na⁺/Ca²⁺ exchangers**
 Blaustein, Mordecai P.; Lariccia, Vincenzo; Khanashvili, Daniel; Annunziato, Lucio; Verkhatsky, Alexei
Cell Calcium (May-01) DOI: 10.1016/j.ceca.2020.102166
53. **N-Methyl-D-Aspartate Receptor Antibodies in Autoimmune Encephalopathy Alter Oligodendrocyte Function**
 Matute, Carlos; Palma, Ana; Serrano Regal, María Paz; Maudes, Estibaliz; Barman, Sumanta; Sánchez Gómez, María Victoria; Domercq, María; Goebels, Norbert; Dalmau, Josep
Annals of Neurology (May-01) DOI: 10.1002/ana.25699
54. **Cannabinoid Control of Olfactory Processes: The Where Matters**
 Terral, Geoffrey; Marsicano, Giovanni; Grandes, Pedro; Soria-Gómez, Edgar
Genes (Apr-16) DOI: 10.3390/genes11040431
55. **Deletion of the cannabinoid CB1 receptor impacts on the ultrastructure of the cerebellar parallel fiber-Purkinje cell synapses**
 Buceta, Ianire; Elezgarai, Izaskun; Rico Barrio, Irantzu; Gerrikagoitia, Inmaculada; Puente, Nagore; Grandes, Pedro
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56. **P2x7 receptors control demyelination and inflammation in the cuprizone model**
 Bernal-Chico, A; Manterola, A; Cipriani, R; Katona I; Matute, C and Mato, S
Brain, Behavior, & Immunity - Health (Apr-01) DOI: 10.1016/j.bbih.2020.100062
57. **Caloric restriction triggers morphofunctional remodeling of astrocytes and enhances synaptic plasticity in the mouse hippocampus**
 Popov, Alexander; Denisov, Pavel; Bychkov, Maxim; Brazhe, Alexey; Lyukmanova, Ekaterina; Shenkarev, Zakhar; Lazareva, Natalia; Verkhatsky, Alexei; Semyanov, Alexey
Cell Death & Disease (Mar-30) DOI: 10.1038/s41419-020-2406-3
58. **Endocannabinoid LTD in accumbal D1 neurons mediates reward-seeking behavior**
 Bilbao, Ainhoa; Neuhofer, Daniela; Sepers, Marja; Wei, Shou-peng; Eisenhardt, Manuela; Hertle, Sarah; Lassalle, Olivier; Ramos-Uriarte, Almudena; Puente, Nagore; Lerner, Raissa; Grandes, Pedro; Lutz, Beat; Manzoni, Olivier J.; Spanagel, Rainer
iScience (Mar-27) DOI: 10.1016/j.isci.2020.100951
59. **(Review) Microglial Corpse Clearance: Lessons From Macrophages**
 Márquez-Ropero, Mar; Benito, Eva; Plaza-Zabala, Ainhoa; Sierra, Amanda
Frontiers in Immunology (Mar-27) DOI: 10.3389/fimmu.2020.00506
60. **(Editorial) Nestin regulates vesicular dynamics in proliferative reactive astrocyte**
 Jorga evski, Jernej; Verkhatsky, Alexei
Acta Physiologica (Mar-15) DOI: 10.1111/apha.13409
61. **On the special role of NCX in astrocytes: Translating Na⁺-transients into intracellular Ca²⁺ signals**
 Rose, C.R.; Ziemens, D.; Verkhatsky, A.
Cell Calcium (Mar-15) DOI: 10.1016/j.ceca.2019.102154
62. **Successful aging: insights from proteome analyses of healthy centenarians**
 Santos-Lozano, Alejandro; Valenzuela, Pedro L.; Llaveró, Francisco; Lista, Simone; Carrera-Bastos, Pedro; Hampel, Harald; Pareja-Galeano, Helios; Gálvez, Beatriz G.; López, Juan Antonio; Vázquez, Jesús; Emanuele, Enzo; Zugaza, José L.; Lucia, Alejandro
Aging (Feb-25) DOI: 10.18632/aging.102826
63. **Early Effects of Aβ Oligomers on Dendritic Spine Dynamics and Arborization in Hippocampal Neurons**
 Ortiz-Sanz, Carolina; Gaminde-Blasco, Adhara; Valero, Jorge; Bakota, Lidia; Brandt, Roland; Zugaza, José L.; Matute, Carlos; Alberdi, Elena
Frontiers in Synaptic Neuroscience (Feb-12) DOI: 10.3389/fnsyn.2020.00002

64. **Microglia Actively Remodel Adult Hippocampal Neurogenesis through the Phagocytosis Secretome**
Iruñe Diaz-Aparicio, Iñaki Paris, Virginia Sierra-Torre, Ainhoa Plaza-Zabala, Noelia Rodríguez-Iglesias, Mar Márquez-Ropero, Sol Beccari, Paloma Huguet, Oihane Abiega, Elena Alberdi, Carlos Matute, Irantzu Bernales, Angela Schulz, Lilla Otrókocsi, Beata Sperlagh, Kaisa E. Happonen, Greg Lemke, Mirjana Maletic-Savatic, Jorge Valero and Amanda Sierra
Journal of Neuroscience (Feb-12) DOI: 10.1523/JNEUROSCI.0993-19.2019
65. **Functional and Metabolic Characterization of Microglia Culture in a Defined Medium**
Montilla, Alejandro; Zabala, Alazne; Matute, Carlos; Domercq, María
Frontiers in Cellular Neuroscience (Feb-07) DOI: 10.3389/fncel.2020.00022
66. **Pathological ATPergic Signaling in Major Depression and Bipolar Disorder**
Illes, P.; Verkhatsky, A.; Tang, Y.
Frontiers in Molecular Neuroscience (Jan-31) DOI: 10.3389/fnmol.2019.00331
67. **(Editorial) Sleep and Mood Disorders**
Verkhatsky, A.; Nedergaard, M.; Steardo, L.; Li, B.
Frontiers in Psychiatry (Jan-16) DOI: 10.3389/fpsyt.2019.00981
68. **NMDA Receptors in Astrocytes**
Verkhatsky, Alexei; Chvátal, Alexandr
Neurochemical Research (Jan-15) DOI: 10.1007/s11064-019-02750-3
69. **Astroglia in Sepsis Associated Encephalopathy**
Shulyatnikova, Tatyana; Verkhatsky, Alexei
Neurochemical Research (Jan-15) DOI: 10.1007/s11064-019-02743-2
70. **Intermittent ethanol exposure during adolescence impairs cannabinoid type 1 receptor-dependent long-term depression and recognition memory in adult mice**
Peñasco, S.; Rico-Barrio, I.; Puente, N.; Fontaine, C.J.; Ramos, A.; Reguero, L.; Gerrikagoitia, I.; de Fonseca, F.R.; Suarez, J.; Barrondo, S.; Aretxabala, X.; García del Caño, G.; Sallés, J.; Elezgarai, I.; Nahirney, P.C.; Christie, B.R.; Grandes, P.
Neuropsychopharmacology (Jan-15) DOI: 10.1038/s41386-019-0530-5
71. **Endocannabinoid receptors contribute significantly to multiple forms of long-term depression in the rat dentate gyrus**
Fontaine, Christine J.; Gräfe, Erin L.; Pinar, Cristina; Río, Itziar Bonilla-Del; Grandes, Pedro; Christie, Brian R.
Learning & Memory (Jan-09) DOI: 10.1101/lm.050666.119

One of the establishment objectives defined by the Board of Trustees when launched ACHUCARRO was that the centre had to contribute to disseminate and transfer human knowledge, and to spread the scientific culture and literacy. We implement this strategic activity in many ways, to adapt to the needs and requirements of the different audiences.

5. Knowledge Transfer

Postgraduate education

ACHUCARRO collaborates with three Masters' programmes organized and coordinated by the University of the Basque Country (UPV/EHU):

- Neuroscience
- Molecular Biology and Biomedicine
- Pharmacology, Development, Assessment, and Rational Use of Medicines

Our personnel also coordinate the Doctorate Programme on Neurosciences, organized together with the Universities of Coruña (Galicia), Castilla – La Mancha, Pablo de Olavide (Seville), and Rovira I Virgili (Catalonia).



PhD theses

In 2020 four of our younger colleagues successfully completed their doctoral training; all of them in the *International mention*, as they completed research stays abroad during their doctorate period.

Other 51 are in different stages of that process.

- ▶ **Dr. Itziar Bonilla del Río** | Laboratory of Ultrastructural and Functional Neuroanatomy of the Synapse

"High resolution imaging to unveil the subcellular layout of the cannabinoid type-1 receptor in rodent models of brain disease"

- ▶ **Dr. Jon Egaña Huguet** | Laboratory of Ultrastructural and Functional Neuroanatomy of the Synapse

"Impact of the transient receptor potential vanilloid 1 deletion on the endocannabinoid system in the mouse dentate gyrus"

- ▶ **Dr. Paula Ramos González** | Laboratory of Neurobiology

"Unraveling the role of astrocytes in the onset and spread of Parkinson's Disease: Important contributors to neurodegeneration"

- ▶ **Dr. Oier Pastor Alonso** | Laboratory of Neural Stem Cells and Neurogenesis

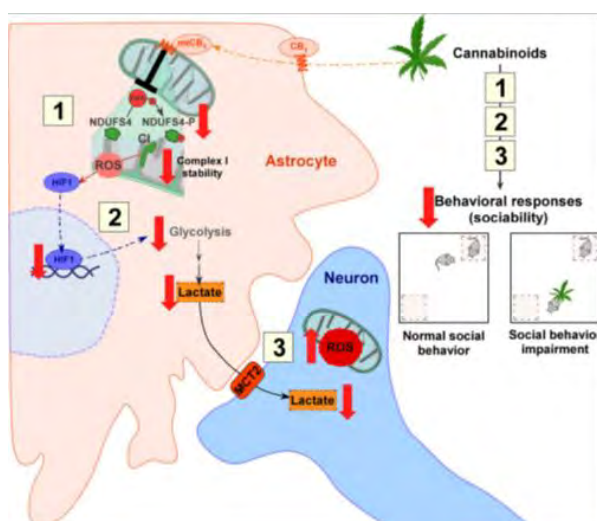
"Hippocampal Neural Stem Cells form origin to Disease"

***Congratulations
Itziar, Paula, Jon and Oier!***

Highlights in research outcomes

Astrocytes are glial cells playing crucial functions in the brain. They take up glucose from the bloodstream to provide energy to neurons for the correct execution of the brain functions. In turn, neurons through receptors expressed in astrocytes shape astroglial dynamics. One of them is the cannabinoid type 1 (CB1) receptor targeted by exogenous and endogenous cannabinoids. This receptor is found in neurons where controls many of the effects caused by cannabinoids.

Signalling of mitochondrial cannabinoid receptors in astrocytes hampers astroglial glucose metabolism that results in neuronal activity and social behaviour impairment



CB1 receptors in astrocytes modulate the crosstalk between these glial cells and neurons thus having influence at synaptic and behavioural level. In this work, the international collaboration group discovered further anatomical evidence on the localization of CB1 receptors in astroglial mitochondria of the hippocampus, prefrontal cortex, piriform cortex and nucleus accumbens. CB1 receptors are more abundant in mitochondria located in astrocytes than in neurons. The activation of the CB1 receptors in astroglial mitochondria reduces the phosphorylation of the mitochondrial complex I subunit NDUF54. The

consequent decrease in complex I activity attenuates the generation of reactive oxygen species in mitochondria that hampers the hypoxia-inducible factor 1 pathway and the glycolytic lactate production in astrocytes, eventually causing neuronal redox stress. The impaired neuronal function ultimately results in social interaction deficits. These findings indicate that, through the regulation of glucose metabolism, mitochondrial CB1 receptors in astrocytes critically affect neuronal activity and social behavior.

"Glucose metabolism links astroglial mitochondria to cannabinoid effects"

Jimenez-Blasco, Daniel; [...]; Grandes, Pedro; Bolaños, Juan P.; Marsicano, Giovanni
 Nature (Jul-08) DOI: [10.1038/s41586-020-2470-y](https://doi.org/10.1038/s41586-020-2470-y)



Achucarro Seminars

January 17th

"Understanding cilia-mediated autophagy in the central nervous system"

Olatz Pampliega-Ormaetxea

Laboratory of Glial and Neuronal Autophagy

January 24th

"The biology of brain colonization by metastatic cells"

Manuel Valiente

Spanish National Cancer Research Center [CNIO] (Madrid)

January 31st

"Neddylation plays a critical role for formation, maturation and maintenance of Schwann cell myelin sheaths"

Ashwin Woodhoo

CIC bioGUNE (Derio)

February 7th

"Parkinson's disease; molecular mechanisms and anti-aggregation therapies"

Nora Bengoa-Vergniory

Oxford University (Oxford, UK)

February 14th

"Semi-synthetic approach for optical interrogation of the nervous system"

Mayya Sundukova

Biofisika - Basque Centre for Biophysics (Leioa)

February 21st

"Brain organoids dissection into strategies for getting a better model for neurodevelopmental associated diseases"

Lluís Cordón Barris

University of Southern California (Los Angeles, USA)

February 27th

"Molecular mechanisms of microglial migration and phagocytosis"

Alazne Arrazola-Sastre

Laboratory of GTPases and Neurosignalling

"On-site and early postnatal generation of adult hippocampal neural stem cells"

Oier Pastor-Alonso

Laboratory of Neural Stem Cell and Neurogenesis Neurosignalling

February 28th

"Using animal models to improve tDCS in humans: advantages and limitations"

Javier Marquez

Universidad Pablo de Olavide (Sevilla)

May 6th

"The use of chimeric models to study Alzheimer's disease"

Amaia Arranz-Mendiguren

Laboratory of Humanized Models of Disease

May 15th

"Models in Microglial Research"

Francesca Peri

University of Zürich (Switzerland)

May 22nd

"Magnetic resonance imaging of the role of hyperglycemia in experimental subarachnoid hemorrhage"

Ana Joya-Villanua

Laboratory of Neuroimaging and Biomarkers of Inflammation

May 29th

"Pharmacogenetic stimulation of mature oligodendrocytes increases myelination and axonal metabolic support"

Ana Palma-Leiva

Laboratory of Neurobiology

June 12th

"Local translation on in neurons and microglia"

Maite Blanco-Urrejola

Laboratory of Local Translation in Neurons and Glia

"Disruption of hippocampal neurogenesis in an alternative mouse model of mesial temporal lobe epilepsy"

Teresa Muro-García

Laboratory of Neural Stem Cells and Neurogenesis

June 26th

"Energy failure drives microglial phagocytosis dysfunction in stroke"

Marlene Soledad Beccari-Galeano

Laboratory of Glial Cell Biology

"Crosstalk between neurons and glia in Alzheimer's disease: a triple co-culture model"

Celia Luchena-Moreno

Laboratory of Neurobiology

July 3rd

"Role of lactate and monocarboxylate transporters in oligodendroglial energy metabolism and (re)myelination"

Vanja Tapavcevic-Mandic

Laboratory of Neurobiology

July 17th

"Microglia-neutrophils crosstalk after brain ischemia"

Amaia Ochoa de Amezaga

Institut de Recerca Biomèdica [IIBB, CSIC] (Barcelona)

July 24th

"Impact of microglia in experimental autoimmune encephalomyelitis development"

Alejandro Montilla-López

Laboratory of Neurobiology

"Endocannabinoid regulation of astroglial cell function in multiple sclerosis"

Álvaro Moreno-García

Laboratory of Neurobiology

September 18th

"IPSC modeling for neurodegenerative diseases: spotlight on glia"

Valentina Fossati

The New York Stem Cell Foundation Research Institute (New York, USA)

September 25th

"Primate-specific susceptibility to neurodegeneration and synucleinopathy induced by patient-derived-synuclein extracts"

Benjamin Dehay

Institut des Maladies Neurodégénératives (Bordeaux, France)

October 9th

"Traumatic brain injury-induced changes in dentate gyrus network"

Joanna Danielewicz

Laboratory of Neural Stem Cells and Neurogenesis

October 23rd

"The fetal circadian clock "gates" the long-term effects of antenatal glucocorticoids"

Mariana Astiz

Lübeck University (Lübeck, Germany)

November 6th

"Metabolic reprogramming in phagocytic microglia: from mitochondrial networks to cell function"

Mar Márquez-Ropero

Laboratory of Glial Cell Biology

"Amyloid- beta oligomers modulate Mbp mRNA granule components"

Adhara Gaminde Blasco

Laboratory of Neurobiology

November 13th

"Understanding phagocytosis by glioma-associated microglia and macrophages: road to alternative immunotherapy for glioblastoma"

Carlos Barcia González

Universidad Autónoma de Barcelona (Barcelona)

December 11th

"Novel tools to study microglia: from phagocytosis modulators to human iPSC-derived cells"

Iñaki Paris-Guerrero

Laboratory of Glial Cell Biology

Highlights in dissemination and advocacy

We do not understand avant-garde scientific research as an activity separated from a social context. Although the scientific research we carry out is fundamental and not oriented, it is unquestionable that the biological questions that we try to solve have a marked practical nature and represent social challenges on ageing, healthy lifestyles, and health protection, with the ultimate objective of improving our environment.

Outreach and advocacy

We deploy our commitment with Equality and Diversity, Talent development, Brain Health Awareness, and fostering a culture of scientific literacy through a set of activities during each year.



Dr. Soraya Martín giving a talk at Ikastola Sagrado Corazon, Bilbao (February)



Dr. Maria Paz Serrano lecturing about Multiple Sclerosis at Hika Ateneo, Bilbao (March)



Dr. Olatz Pampliega at Zunzunegi High-school, Portugalete (February)



Virginia Sierra, Noelia Rodríguez, Mar Marquez, Sol Beccari advocating at Koldo Mitxelena, Vitoria-Gasteiz (February)

#February11

The Science Park of the UPV/EHU in Leioa (metropolitan area of Bilbao), hosts the headquarters of ACHUCARRO, inaugurated in June 2017.

6. Infrastructure and Equipment

The proximity with Bilbao, and its airport, and the faculties of the University with the degrees (Biology, Biochemistry, Medicine...) that give access to research work in neurobiology is an asset that allowed us to expand our potential.

ACHUCARRO currently occupies the third floor of the Sede building, a space of 2000 m² in a privileged location within the campus of the UPV/EHU. Additionally, some of the research groups have laboratories and office spaces in the Faculty of Medicine and Nursing, at 400 metres from the main location.



With the advantage of this location in the campus, where the general facilities (microscopy, genomics, proteomics, etc.) for research support of the university are located, our strategy was to complement the existing resources with the specific ones of our field and those that provide an added value or competitive advantage, like the resources for performing:

- *Flow Cytometry and Fluorescence-activated Cell Sorting*
- *Functional Genomics:*
 - *Reporter constructs, and Recombinant expression*
- *Genotyping*
- *Immunofluorescence, Immunochemistry, and Immunohistochemistry*
- *Optical microscopy:*
 - *Epifluorescence, Confocal with STED super-resolution, Calcium Imaging and Two-photon microscopy, Slide scanning and High-content Screening (HCS) Platform*
- *Advanced image analysis:*
 - *Deconvolution and HCS platforms, and In-house developed software*
- *Protein detection:*
 - *SIMOA - Single MOlecule Array technology*
- *Electrophysiology*

<https://www.achucarro.org/facilities>

The Basque Government establishes challenging scientific and management objectives for research organisations with the BERC accreditation. The following indicators reflect the evolution on the performance of ACHUCARRO, with this panel agreed by the Basque Government and ACHUCARRO for the current strategic period.

7. Main performance indicators

On the one hand, it is undeniable that the effects of the situation derived from the pandemic will have adverse effects on the results of research organizations. Depending on the activity (research, training, knowledge transfer, etc.), in the short, medium, and long term.

On the other hand, we have been able to appreciate an effect that could be considered positive in the short term, the number of scientific publications published worldwide, in all areas of knowledge, in 2020 has far exceeded the figures that we had been obtaining in previous years.

The following indicators start showing some of these effects.

Indicator 1

Total number of indexed publications

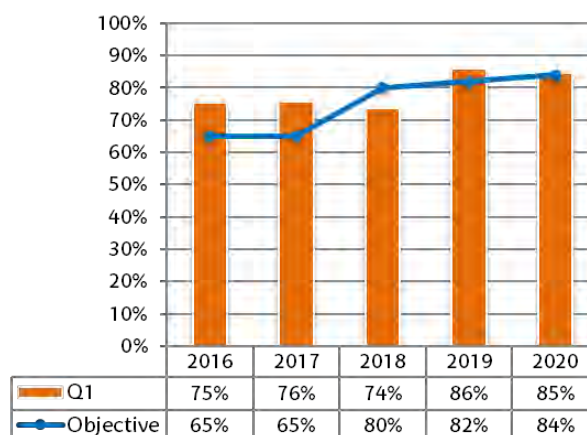
Sources:
Scopus & Web of Science



Indicator 2

% of publications in quartile 1 of their research areas

Source:
Scimago Journal Ranking

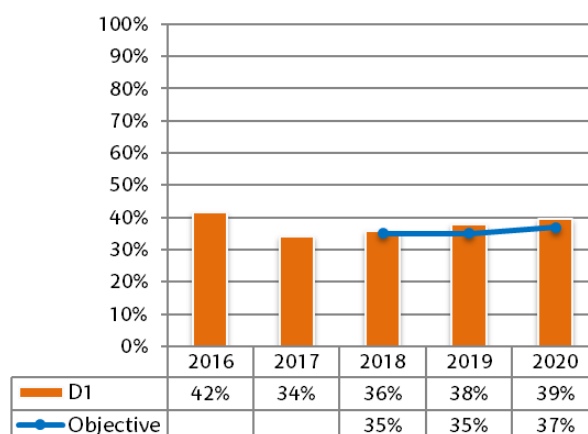


Indicator 3

% of publications in decile 1
of their research areas (*)

Source:
Scimago Journal Ranking

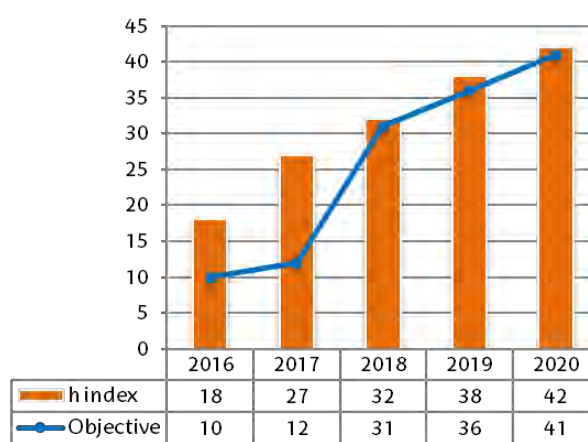
(*) The objective was set in
2018



Indicator 4

h-index for ACHUCARRO

Source:
Scopus

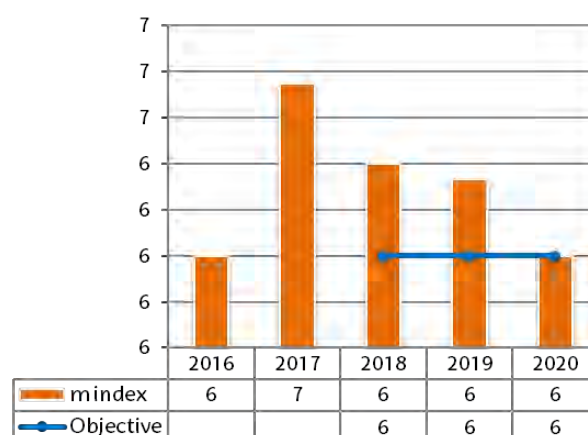


Indicator 5

m-index for ACHUCARRO ()*

Source:
Scopus and Web of Science

(*) The objective was set in
2018



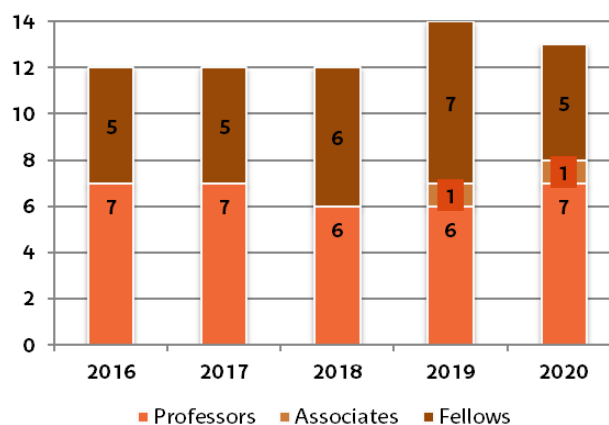
While Scopus and Web of Science produce similar numbers for the h-index indicator of the accumulation of all the publications and their citation of ACHUCARRO, for the period 2012-2020, it is remarkable that Google Scholar, with its different algorithm to calculate h-index, reflects 88 for the same indicator, and 366 for the i10 indicator, that they also use: scholar.google.es/user=hO1jBxYAAAAJ

The following talent attraction and retention indicators show the attractiveness of our organisation for researchers from abroad. They reflect that more than 13% of our research staff has an appointment with Ikerbasque, and 17% of them are hired in the most competitive calls in our environment: the Ramón y Cajal and Ikerbasque fellowship programmes.

Indicator 6

Total number of Ikerbasque Researchers (Professors, Associates and Fellows)

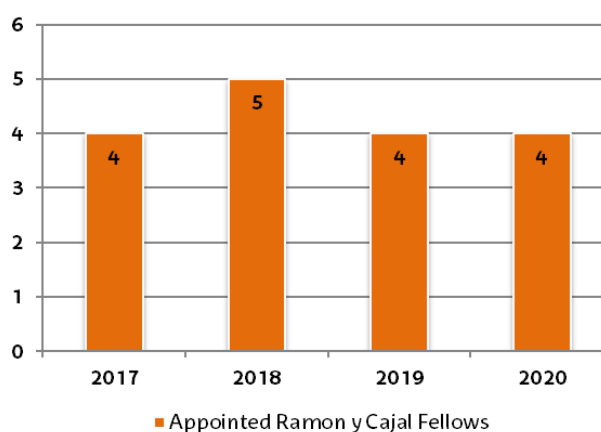
Source:
Internal



Indicator 7

Total number of Ramón y Cajal Fellows

Source:
Internal

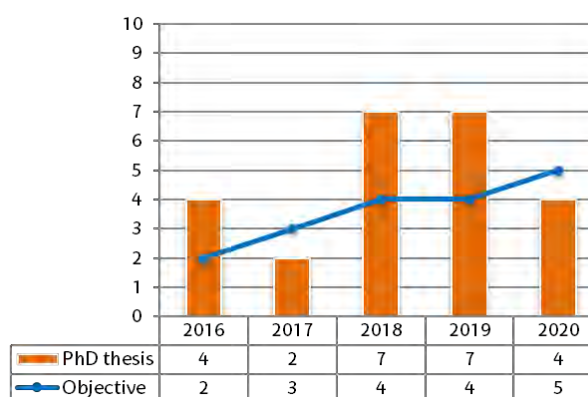


Our capability to contribute to postgraduate education has been affected by the Covid-19 pandemic. The lockdown affected many of the ongoing PhD projects. We also had to stop internships of master's students. Nevertheless, the gradual recovery of face-to-face and experimental activity starting in the summer made it possible to partly recover and mitigate the effects caused by the health emergency situation.

Indicator 8

Completed PhD Thesis

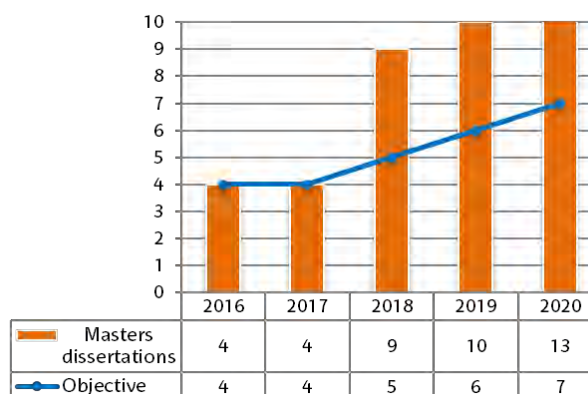
Source:
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Indicator 9

Completed Masters' Dissertations

Source:
Internal

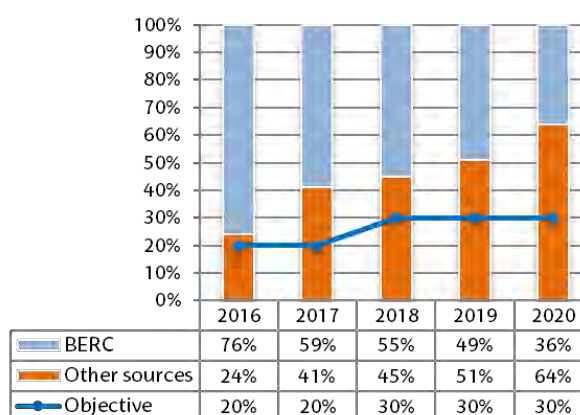


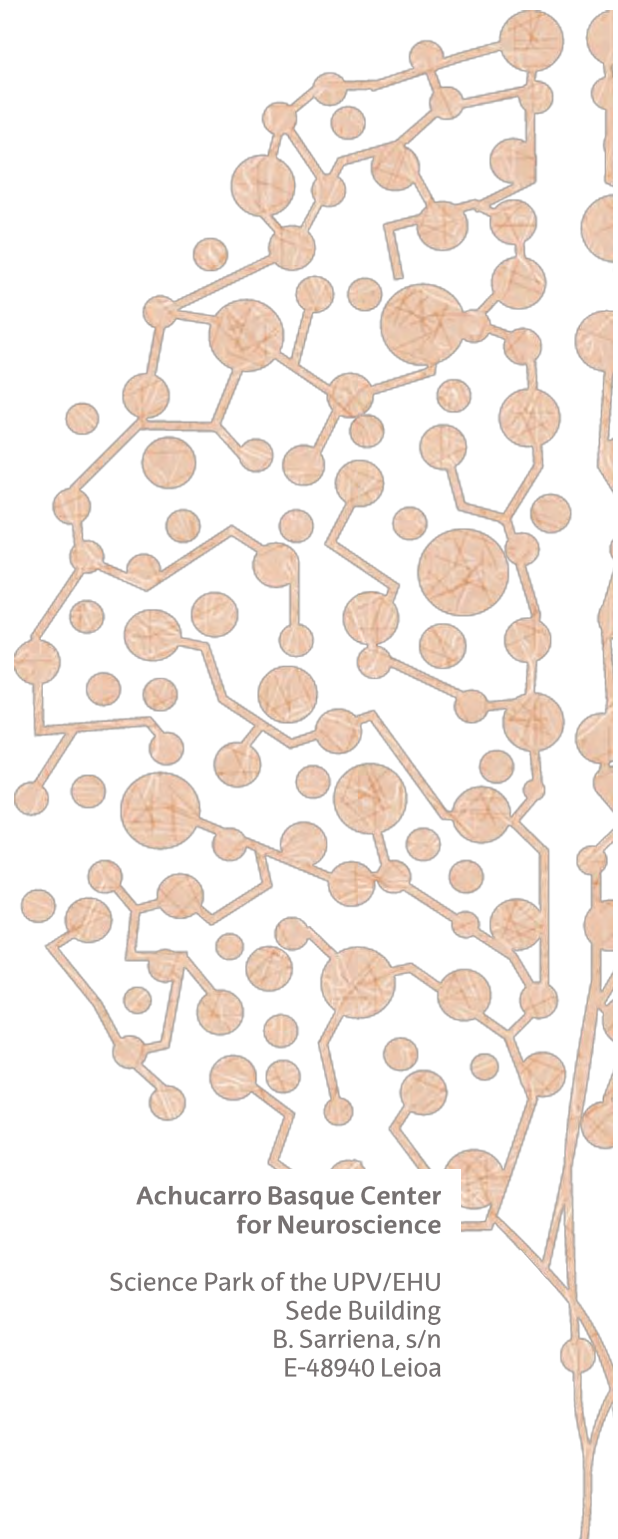
Finally, the financial stability and sustainability of ACHUCARRO keeps consolidating, due to the increase in the raising competitive funding, national and internationally, both public and private.

Indicator 10

% of funding different from BERC

Source:
Internal





**Achucarro Basque Center
for Neuroscience**

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