BioEnredados

Uniendo Ciencia y Vida

Third Season - Volume 2

A production of:

CIC bioGUNE

MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

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Welcome to our podcast BioEnredados: Uniendo Ciencia y Vida!

We are your gateway to the cutting-edge research in biosciences that is taking place at the heart of CIC bioGUNE.

In each episode, we will immerse you in an exciting journey through the most innovative scientific and technological advances that are transforming our understanding of the biosciences, from basic chemistry to biology and medicine.

Our mission is clear: to bring you science in an accessible and exciting way. We aim to ignite your curiosity and nurture your interest in cutting-edge bioscientific research.

Are you ready?

ALS

A RARE DISEASE, AN URGENT CHALLENGE

Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease that progressively affects motor neurons, the cells responsible for transmitting signals from the brain to the muscles. As these neurons deteriorate, patients gradually lose the ability to move, speak, and breathe, while cognitive functions often remain preserved. Understanding what causes this degeneration is one of the major challenges in modern neuroscience.

Although considered a rare disease, ALS has a profound impact on patients, families, and healthcare systems. Around 4,000 people live with ALS in Spain, facing a condition that requires continuous care and significantly alters daily life. Current treatments can only slow disease progression in some cases, highlighting the urgent need for new therapeutic approaches.

ALS is a complex disease with multiple origins. While around 10% of cases are linked to known genetic mutations, most cases are classified as sporadic, meaning that the factors triggering the disease remain largely unknown. This complexity makes research particularly challenging, as understanding the molecular processes inside affected neurons is essential for developing effective treatments.

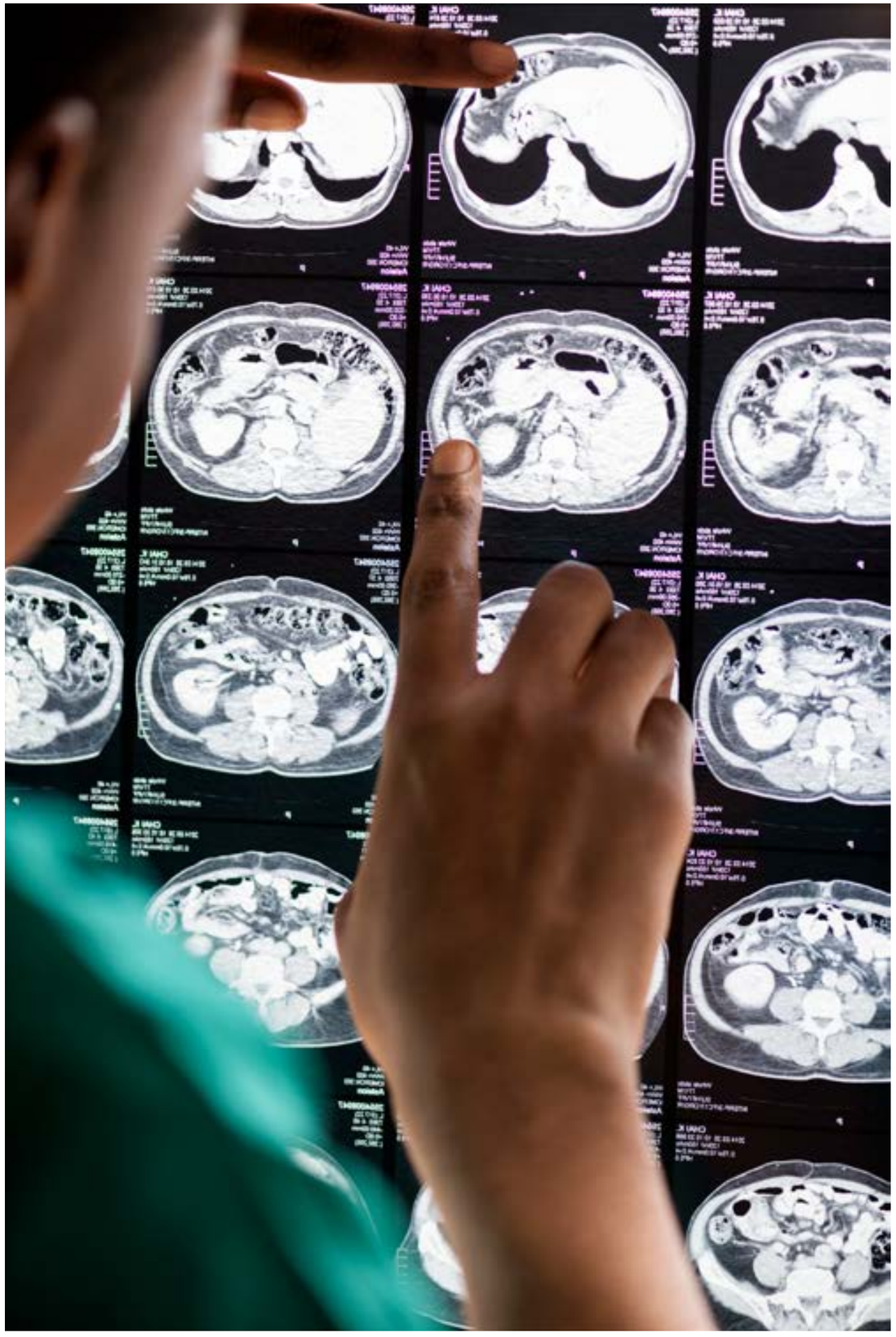
Recent advances in molecular biology and genetics are opening new possibilities to study ALS beyond symptom management. At the forefront of this research are Dr. **Raúl Pérez-Jiménez**, head of the Synthetic Biology Laboratory at CIC bioGUNE, and Dr. **Ylenia Jabalera**, postdoctoral researcher and La Caixa Junior Leader in the same group. Supported by FUNDELA, their work aims to uncover new mechanisms behind ALS and contribute to the development of future therapeutic strategies.

What do we know today about ALS, and why does this disease remain so challenging to understand?

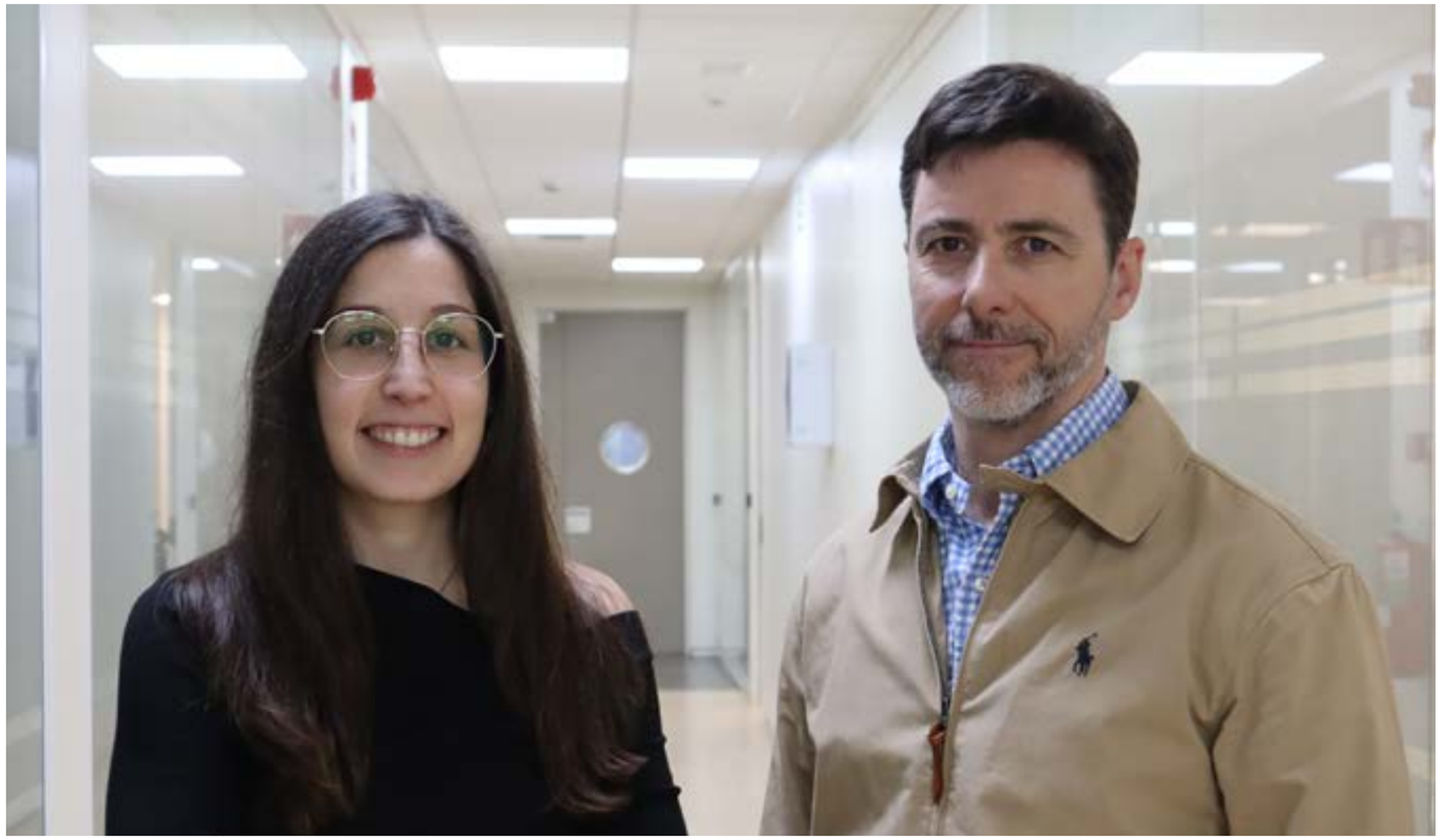
- As has been mentioned already, the central problem in ALS is the progressive death of motor neurons, which leads to a gradual loss of function and, ultimately, can be fatal. However, one of the greatest challenges in understanding this disease is its complexity and multifactorial nature. Many different factors appear to be involved.

As research advances, we are discovering that ALS is like a complex puzzle, with many pieces that we still do not fully understand or know how to fit together. We now know that there are different forms of the disease. Around 10% of cases are familial, meaning they are linked to inherited genetic mutations, while the remaining 90% are considered sporadic cases, where the exact causes are still largely unknown.

In recent years, the number of genes associated with ALS has continued to grow, and we now know that dozens of genes can be involved. In some cases, a mutation in a single gene can be enough to trigger the disease, while in others,



Right: Magnific. Doctor reading brain by rawpixel.



factors may contribute. Although we are still working to understand the precise mechanisms behind ALS, it is becoming increasingly clear that genetic factors play a key role in the development of the disease.

Despite our growing understanding of the biological mechanisms behind ALS, why does developing effective treatments remain such a major challenge?

- There are several reasons. First, these diseases are biologically complex and clinically very heterogeneous. Each patient can present with different underlying causes, and in many cases we still do not fully understand them.

For example, in sporadic ALS, the mechanisms behind disease development remain largely unknown. Current research is revealing that, beyond genetic factors, other elements such as the microbiome, the immune system, and epigenetic changes may also play important roles. Even among patients carrying alterations in the same gene, different mutations can lead to very different disease manifestations and clinical outcomes.

A second major challenge is related to treatment. We are dealing with diseases that affect the nervous system, where neurons and the blood–brain barrier create additional obstacles. While this barrier is essential for protecting the brain from external agents, it also makes it extremely difficult to deliver effective therapies to the areas where they are needed most.

At CIC bioGUNE, your team is exploring ALS through genetic editing and synthetic biology technologies. What are the main questions you are trying to answer, and what new perspectives can these approaches bring to the study of the disease?

“We have developed a broad-spectrum gene-editing platform capable of targeting different mutations, and we are designing delivery systems to cross the blood-brain barrier.”

- Our group develops gene-editing tools using molecular evolution techniques. These are engineered systems that do not exist in nature but have been designed with properties that make them particularly useful for biotechnology and, potentially, for therapeutic applications.

In ALS, mutations in specific genes contribute to the degeneration of motor neurons. Until recently, these mutations were considered irreversible, but advances in gene-editing technologies have opened the possibility of correcting them. The challenge is not only identifying the disease-causing mutations, but also designing tools that can precisely target them and, crucially, deliver them to motor neurons, which are among the most difficult cells to reach.

Our research addresses both challenges. We have developed a broad-spectrum gene-editing platform capable of targeting different mutations, and we are designing delivery systems that can cross the blood-brain barrier. We have already demonstrated promising results in experimental models and are now working to bring these advances together into future therapeutic strategies.

In addition to their therapeutic potential, these tools can also be used to generate more accurate disease models. Better models will help us understand how ALS develops and progresses, ultimately accelerating the development of new treatments.

Right, up: Raúl Pérez-Jiménez & Ylenia Jabalera, below: podcast episode cover.

Despite recent advances, what are the main scientific challenges that remain, and what are the realistic prospects for the coming years?

- One of the main challenges is gaining access to patient data and samples. Large international initiatives are now creating genetic repositories that allow researchers to compare patient genomes and identify new therapeutic strategies. Patient participation is also essential, as their genetic information and cellular samples provide invaluable insights into the disease.

Another major challenge is funding and developing better research models. With support from organizations such as FUNDELA and other sources, we are building a research line focused on creating new tools and improving experimental systems. Our goal is to develop more versatile treatments that can benefit a larger number of patients, beyond the small percentage who currently respond to available therapies.

FROM THE LAB TO THE HIMALAYAS

SCIENCE, SOLIDARITY, & GLOBAL VISIBILITY

High above the Himalayas, at more than five thousand metres above sea level, a flag is carried through one of the most extreme environments on Earth. Surrounded by ice, wind, and silence, this flag represents far more than a journey to a mountain summit. It represents years of research, the hopes of people affected by rare diseases, and the families who face these conditions every day.

The Everest Prion Challenge 2026 is built around this idea: bringing science closer to society and transforming a symbolic expedition into a message of awareness, commitment, and support for prion disease research. Behind every scientific discovery are human stories and an urgent need to continue advancing towards better understanding, diagnosis, and treatments.

Following a previous episode exploring what prion diseases are and why they remain one of the major challenges in modern biomedicine, today we focus on another essential aspect of science: its ability to connect researchers, patients, and society. Initiatives like this highlight that progress in rare diseases depends not only on laboratory discoveries, but also on visibility, collaboration, and collective engagement.

Leading this journey is **Josu Galarza Ahumada**, predoctoral researcher in the Prion Laboratory, led by Joaquín Castilla, at CIC bioGUNE. His work contributes to the ongoing effort to understand prion biology and develop new approaches against these rare but devastating disorders.

To begin, how did the Everest Challenge come about, and what are the main goals behind this charitable expedition?

- The Everest Challenge was born from the idea of giving greater visibility to prion diseases. These are rare diseases, and one of the main challenges faced by rare disease communities is that they often remain unknown to the general public. They are not widely discussed, and this lack of awareness can make it more difficult to obtain research funding, to be considered in healthcare policies, or to ensure that these diseases receive the attention they deserve.

Our main goal is therefore to raise awareness and help people understand what this group of diseases represents. At the same time, we want to show our strong support for patient organizations and foundations around the world that work tirelessly to support families and promote research.

In Spain, the Spanish Prion Disease Foundation has been doing an outstanding job in raising awareness, supporting science, and helping patients. They have been one of the driving forces behind this project. Through the Everest Challenge, we also want to demonstrate our trust in these organizations, highlight their work, and show that every effort made by these associations contributes to a common goal: increasing visibility, supporting research, and standing alongside affected families.

Right: The expedition team reaches the summit.

And you are taking part not only as a researcher but also as a mountaineer. What does it mean to you personally to bring together science and the mountains in this project?

- For me, being able to combine these two very important parts of my life is truly wonderful. When Joaquín first told me about the idea, I could hardly believe it. At the beginning, it was difficult to find people who wanted to take part, but when they asked me, I immediately said yes. It was an opportunity I could not miss.

On one hand, I am a researcher studying prion diseases in Joaquín Castilla's laboratory. Our goal is to understand these diseases better, to uncover how they work, and ultimately to contribute to the search for treatments. Finding a cure is always the final objective behind biomedical research.

On the other hand, this project brings together something that is also very important to me personally: the mountains. It is an incredible opportunity, both from a sporting perspective and from the personal experience of being in such a unique environment. The Himalayas are one of the most extraordinary places on Earth.

I've always enjoyed the mountains because they offer a moment of disconnection, a chance to step away from the daily routine and simply be surrounded by nature. It is a completely different experience from the laboratory and everyday work.

So, for me, this is a fantastic opportunity. And being able to do it for such an important cause, helping people hear about prion diseases and understand the challenges faced by patients and families, makes it even more meaningful. It is truly an incredible project.

As part of the expedition, the flag of the International PRION 2026 Congress will be taken to Everest Base Camp. What message do you hope this gesture conveys to the scientific community and to affected families?

- I think it is essential for researchers to remember that behind every scientific project there are real people: patients and families facing these diseases every day. Initiatives like the Everest Challenge help bring together researchers, patients, and organizations around a shared goal.

Science cannot remain only inside the laboratory; it must be shared with society. Communicating our work helps people understand the progress being made and reminds us of the human impact behind every discovery.

Beyond the sporting challenge itself, how can an initiative like this truly help improve visibility and support for rare disease research?

- These kinds of initiatives are important because visibility is the first step towards progress. The more people hear about rare diseases, the easier it becomes to generate support for research, attract funding, and encourage institutional and media attention.

Right, up: Josu Galarza, below: podcast episode cover.

"Initiatives like this raise awareness, bring patients' needs closer to society and institutions, and remind us that although research takes time, there is hope behind every effort."

For families affected by these conditions, having legal and institutional recognition can make a significant difference. Rare diseases often affect a small number of people and can remain invisible to society, which is why raising awareness and building collective support are essential.

Organizations such as FEDER help bring these communities together, ensuring that rare diseases are not addressed individually but through a shared effort to make patients and their needs heard.

What message would you like to send from Everest to patients and their families, to society as a whole, and to the scientific community?

- I would like to share a message of commitment and hope. Researchers are not only working in laboratories; our work is ultimately about people and improving lives. Initiatives like this help raise awareness, bring patients' needs closer to society and institutions, and remind us that although scientific progress takes time, there is always hope behind every research effort.

IMMUNOTHERAPY

REPROGRAMMING OUR DEFENSES AGAINST CANCER

Every day, our immune system works quietly in the background, maintaining a delicate balance that keeps our body healthy. Beyond protecting us from infections, this complex network of cells and molecules also plays a key role in identifying and controlling abnormal cells, including those that could become tumors.

But cancer can disrupt this surveillance system. Some tumors develop ways to escape immune detection or create an environment that weakens the body's natural defenses. This has changed the way researchers approach cancer: understanding the disease is no longer only about studying tumor cells themselves, but also about uncovering the complex relationship between cancer and the immune system.

Among the most innovative strategies emerging from this field is CAR-T cell therapy, an approach that involves modifying a patient's own immune cells in the laboratory so they can better recognize and respond to cancer cells. While this therapy has achieved remarkable results in some blood cancers, applying it to solid tumors, such as breast cancer, remains a major challenge. These tumors create a complex environment that can limit the ability of immune cells to reach and effectively act against them.

To improve these treatments, scientists are investigating the molecular signals that distinguish healthy cells from tumor cells. Among these signals are glycans, complex sugar structures found on the cell surface that may act as biological markers and provide new opportunities for developing more precise immunotherapies.

To explore how the immune system recognizes cancer, how immune cells can be reprogrammed, and why solid tumors remain difficult to treat, we speak with Dr. **Lorena Pérez Gutiérrez**, postdoctoral researcher in the Cancer Glycoimmunology Laboratory at CIC bioGUNE.

To provide some context, how do cancer and the immune system interact in the body, and what role does this relationship play in disease progression?

- The immune system plays a crucial role in cancer development. Under normal conditions, our immune defenses can recognize and eliminate abnormal cells, including tumor cells, in a process known as tumor immunosurveillance. Immune cells are constantly monitoring the body, looking for potential threats, and when they detect a tumor cell, certain cells such as T cells can attack and destroy it.

However, as tumors develop, they can learn how to avoid this immune response. Cancer cells evolve different escape mechanisms that allow them to remain unnoticed or prevent immune cells from effectively attacking them. In other words, tumors find ways to hide from our defenses and create an environment that helps them continue growing.

Right: Taken from Magnific image bank.

This is why immunotherapies are becoming such an important area of research: their goal is to understand these escape mechanisms and find ways to restore the ability of the immune system to recognize and control tumor cells.

What strategies are currently being used in immunotherapy to strengthen the immune response against cancer, and how does CAR-T cell therapy work?

- Well, as we mentioned, CAR-T therapy is probably one of the immunotherapy approaches that people are most familiar with. But before CAR-T, the first major advances in immunotherapy came from antibodies. Around 2013, researchers developed antibodies capable of blocking the signals that prevent T cells from attacking tumor cells. In other words, they helped "release the brakes" on the immune system, allowing these cells to recover their ability to recognize and eliminate cancer.

These antibody-based therapies became part of clinical practice, often combined with chemotherapy, because while chemotherapy attacks the tumor directly, immunotherapy helps reactivate the immune response against it. Since then, new strategies have continued to emerge, including CAR-T therapy. This approach takes a patient's own T cells, modifies them in the laboratory so they can recognize specific molecules on cancer cells, and then returns them to the patient.

CAR-T has already shown very promising results, especially in blood cancers, where it is easier to identify specific targets on tumor cells. However, applying these strategies to other types of cancer, such as solid tumors, remains a major challenge. Beyond CAR-T, researchers are also exploring other ways to enhance T cells, either by modifying them or by using treatments that help restore their ability to respond effectively.

"Using immune cells from donated blood samples and animal models, we test how these approaches can improve the ability of the immune system to detect and respond to tumors."

Focusing on your research, what role do glycans or cell-surface sugars play in the interaction between tumors and the immune system, and how are you studying them in the laboratory?

- Glycans are chains of sugars found on the surface of all cells, including tumor cells. They act as molecular signals that help the immune system identify what is happening, but cancer cells can modify these sugar patterns and produce them in much higher amounts, creating a kind of "shield" that makes them harder for immune cells to recognize.

Our goal is to understand this interaction and find ways to restore immune recognition. We are developing strategies such as CAR-T cells and antibodies that target these glycan-related signals. Using immune cells from donated blood samples and animal models, we test how these approaches can improve the ability of the immune system to detect and respond to tumors.

What are the main challenges in immunotherapy today, and what does the future look like for developing new treatments?

- One of the main challenges of immunotherapy is that it has been much more successful in blood cancers than in solid tumors. In blood cancers, tumor cells circulate through the bloodstream, making it easier for immune cells to find and target them. However, in solid tumors, which are dense structures made up of many different cell types, immune cells often struggle to reach the inside of the tumor.

That is why understanding the tumor microenvironment is so important. A tumor is not only made of cancer cells; it also contains many other cells that the tumor can manipulate to support its growth. One strategy is to understand these interactions and find ways to use the tumor environment to improve immune responses.

Another major challenge is specificity. Tumors are constantly evolving and can develop mechanisms to avoid immune detection, sometimes making themselves look like normal cells. The goal is to design treatments that can precisely target cancer cells while minimizing effects on healthy tissues.

Right, up: Lorena Pérez, below: podcast episode cover.

GUT HEALTH

AN ESSENTIAL BALANCE FOR OUR WELLBEING

Our gut does much more than digest food. It absorbs nutrients, helps regulate metabolism, supports the immune system, and even communicates with the brain through a complex network of signals. Far from being just part of the digestive system, the intestine plays a central role in maintaining our overall health.

Yet millions of people live with gastrointestinal disorders that can significantly affect their quality of life. Some conditions, such as Crohn's disease and ulcerative colitis, have a strong genetic component. Others, including irritable bowel syndrome (IBS), are far more complex, arising from a combination of genetics, diet, the gut microbiota, stress, and other biological factors.

Understanding how these factors interact remains one of the biggest challenges in gastrointestinal research. By uncovering the mechanisms that regulate intestinal function, scientists hope to better understand why these disorders develop and identify new ways to improve their diagnosis and treatment.

To find out, we turn to Dr. **Cristian Díaz**, postdoctoral researcher in the Gastrointestinal Genetics Laboratory at CIC bioGUNE, led by Dr. Mauro D'Amato. Together, we examine how genetics and other biological factors shape gut health and how research is advancing our understanding of gastrointestinal diseases.

When we talk about gut health, what does it actually mean? What factors help maintain a healthy gut, and why is it so important for our overall wellbeing?

- As you mentioned, gut health is influenced by many different factors. Scientists usually divide them into environmental factors and genetic factors. Environmental factors include the ones we know best, such as diet and physical activity. We often say "we are what we eat," and there is some truth to that: many people notice that even small changes in their diet can quickly affect how their gut works. Other factors are less obvious but just as important, including a healthy immune system, which needs to protect us without overreacting, and good mental health. Stress, anxiety, and depression can all influence the communication between the brain and the gut, affecting intestinal function.

The gut microbiota is another important piece of the puzzle, although it is largely shaped by these environmental factors. Genetics also plays a role, influencing how our immune system, microbiota, and intestinal function respond, making some people more prone to digestive disorders than others. Good gut health is essential for our overall wellbeing. When the intestine is not functioning properly, nutrient absorption can be affected, the risk of infections may increase, and symptoms such as bloating, abdominal pain, fatigue, constipation, or diarrhea can significantly reduce quality of life.

Right: Taken from Magnific image bank.

There are many different gastrointestinal disorders, some better understood than others. What do we currently know about conditions such as irritable bowel syndrome, and why is it still so difficult to understand what causes them?

- Irritable bowel syndrome (IBS) is part of a group of conditions called functional gastrointestinal disorders. I actually like this name because it describes the situation quite well: the digestive system is not damaged or failing, but it does not work exactly as it should, causing symptoms that can have a real impact on people's quality of life.

The tricky thing is that these disorders are usually diagnosed based on symptoms, what the patient experiences and describes. The problem is that many of these conditions overlap, so two people with the same IBS diagnosis can actually have very different reasons behind it. One person may have difficulties digesting certain foods, another may have changes in their gut microbiota, inflammation after an infection, prolonged stress, or differences in how their intestine moves.

That is also why the same treatment does not work for everyone. For example, a low-FODMAP diet, which reduces certain carbohydrates that are difficult to digest, can work very well for some patients but not for others. This tells us that IBS is not just one disease with one cause, but rather a combination of different mechanisms that can lead to similar symptoms.

Focusing on the research carried out at CIC bioGUNE, what are the main areas of study in your group, and what questions are you trying to answer about gut health and gastrointestinal disorders?

- In our group, we study the genetics behind gastrointestinal disorders using large population datasets from biobanks, with information from hundreds of thousands of individuals. This helps us identify genetic variants linked to conditions like irritable bowel syndrome and better understand the biology behind them.

We also study specific symptoms, such as intestinal transit, using health questionnaires that allow us to analyze gut function in large populations. In one of our recent studies, we found that vitamin B1 may have a protective role against constipation and identified genetic factors that make some people more susceptible to deficiencies.

Another area we investigate is sucrase-isomaltase, an enzyme involved in sugar digestion. Some genetic variants reduce its activity, causing symptoms that can be mistaken for irritable bowel syndrome. Understanding these individual differences is key to developing more personalized approaches, including targeted dietary strategies for each patient.

Looking ahead, what are the main challenges in this field, and what advances do you hope to see in the coming years?

- One of the biggest challenges in our field is taking the genetic signals we identify in research and translating them into real treatments that can reach patients. Sometimes this process can be quite direct. For example, in the case of a deficiency in the enzyme sucrase, the solution can involve dietary changes or even enzyme replacement, similar to how people with lactose intolerance can take supplements to help digest certain foods.

However, for many other discoveries, moving from a genetic finding to a clinical application requires several steps. One approach is to validate these findings in model organisms: if we identify a gene that plays an important role in intestinal function, we can study how changes in that gene affect the organism and use this knowledge to develop new treatments that target the root cause of the problem.

At the same time, we are moving toward a more integrated view of gut health. Since intestinal disorders are influenced by many factors, we are studying not only human genetics, but also how our genes interact with the microbiota and our diet. Bringing all these elements together could help us move closer to a more personalized approach for each patient.

"We are moving toward a more integrated view of gut health, studying not only genetics but how genes interact with the microbiota and diet to influence intestinal disorders."

Right, up: Cristian Díaz, below: podcast episode cover.

IMPACT OF NIGHT WORK

HEALTH, METABOLISM, & CIRCADIAN RHYTHMS

Our bodies are guided by an internal clock that coordinates essential processes such as sleep, metabolism, and the way we use energy. Known as the circadian rhythm, this biological system is synchronized with the cycles of light and darkness and plays a key role in maintaining the body's balance.

However, modern lifestyles have changed the way we live, and millions of people now work night or rotating shifts, disrupting this natural timing system. This misalignment affects far more than sleep: it can interfere with important metabolic processes, including glucose regulation and fat metabolism.

Over time, chronic disruption of the circadian rhythm has been linked to a higher risk of metabolic problems, such as insulin resistance, weight gain, and reduced efficiency in energy use. These changes develop gradually as the body is repeatedly forced to function outside its natural biological schedule.

To better understand how night work affects the body, we explore the connection between circadian rhythms, metabolism, and health with Dr. **Carolina Conter**, postdoctoral researcher in the Liver Disease Laboratory at CIC bioGUNE, led by Dr. Malu Martínez-Chantar. Together, we discover how the liver and brain communicate in this process, the role of hydrogen sulfide in energy regulation and inflammation, and how nutrition could help modulate these effects.

When we talk about night work, what exactly happens in the body, and how does it affect metabolism?

- This topic is especially interesting to me because, when I was a student, I also worked at night, in a nightclub during weekends. Now, researching this field, I realize what those night shifts can actually mean for our body.

When we talk about night work, we are referring to something that is part of everyday life for many people: healthcare workers, transport employees, security staff, factory workers… While part of society is sleeping, another part is active. But for our body, nighttime is not just another time of the day. We have an internal clock, the circadian rhythm, that regulates when we should be awake or resting, when hormones are released, when we feel hungry, and how we use energy.

During the night, our body is naturally prepared to rest: body temperature changes, melatonin levels increase, alertness decreases, and metabolism adapts. When someone works at night, this creates a conflict between the external environment and the body's internal signals. Over time, this disruption can affect appetite, glucose regulation, insulin sensitivity, and increase the risk of metabolic and cardiovascular problems.

That is why our research focuses not only on sleep loss, but on how changing our natural schedules affects the molecular signals that

Right: Taken from Magnific image bank by pvproductions.

control metabolism. One of the molecules we are studying is hydrogen sulfide, which could act as a link between the biological clock, energy regulation, and liver function.

In this context, you have mentioned that hydrogen sulfide plays an important role in this process. What function does it have in metabolism?

- Hydrogen sulfide is a fascinating molecule because most people associate it with a toxic gas or its characteristic smell. But our bodies actually produce it naturally, in small amounts, where it acts as a signaling molecule that helps regulate different cellular processes.

It is mainly produced through three enzymes involved in sulfur metabolism. Although their names are complex, their role is easier to understand: they are connected to pathways that process sulfur-containing amino acids, such as cysteine and methionine. Through these pathways, hydrogen sulfide is linked to energy production, mitochondrial function, oxidative stress, and inflammation regulation.

In our case, we are interested in understanding how this molecule connects metabolism with the effects of night work. We have developed an animal model that mimics the conditions of a night-shift worker, and we have observed that hydrogen sulfide levels decrease under these circumstances. Now, we are studying whether modulating this pathway could help maintain a healthier energy balance and reduce the metabolic impact of disrupted schedules.

Focusing on your research at CIC bioGUNE, particularly the LIVERMOON project, how are you studying the relationship between metabolism, the liver, and circadian rhythms?

- We study how circadian rhythm disruption affects metabolism, especially in the liver, but also in other tissues such as muscle, adipose tissue, and the brain. A key focus is understanding the role of hydrogen sulfide: how its metabolism changes with night work and whether we can intervene to reduce the effects of this desynchronization.

To study this, we have developed a mouse model that mimics night work by reversing their feeding schedule. Since mice are naturally nocturnal, eating during the day represents eating at the wrong biological time. Using metabolic cages, we can closely monitor their food intake, activity, energy use, and metabolic changes.

One of the innovative aspects of the project is testing whether nutrition can help restore hydrogen sulfide levels. We have developed a plant-based diet designed to activate the metabolic pathways involved in its production.

What we see is that changing feeding schedules alters metabolism: animals develop higher glucose levels, insulin resistance, weight gain, and reduced hydrogen sulfide levels. However, with this nutritional intervention, many of these changes are reversed. Glucose regulation improves, insulin resistance decreases, hydrogen sulfide levels recover, and animals are better able to use fat as an energy source.

These results suggest that circadian disruption affects the whole body, but also that lifestyle interventions, such as diet, could help restore metabolic balance and protect health.

What are the main challenges in this field today, and what advances do you hope to see in the coming years?

- The goal is to get closer to each person's reality. Night work cannot disappear, as it is essential in many professions such as healthcare, transport, emergency services, or industry.

The key question is not only whether working at night is harmful, but how we can reduce its impact. Our research suggests that a plant-based diet enriched with plant proteins could help improve metabolic balance and reduce some of the effects of night work. Ultimately, we are moving towards more personalized nutrition, understanding not only what we eat, but also when we eat, to better support the body.

"The goal is to understand how we can reduce the impact of night work. Personalized nutrition, including dietary strategies, could help maintain balance and support health."

Right, up: Carolina Conter, below: podcast episode cover.

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EXCELENCIA SEVERO OCHOA

Fundación científica asociación española contra el cancer

EUSKO JAURLARITZA GOBIERNO VASCO

Established in 2004 under the auspices of the Basque Government, CIC bioGUNE is dedicated to advancing biomedical science. Its interdisciplinary team of over two hundred scientists and technicians delves into the molecular foundations and mechanisms of diseases, aiming to innovate in diagnostic methods and foster the advancement of innovative therapies.

Recognized as a Severo Ochoa Center of Excellence, CIC bioGUNE conducts pioneering multidisciplinary research integrating chemistry, structural, molecular and cellular biology, immunology and state-of-the-art omics technologies. Our infrastructure includes advanced technological platforms that support scientific discovery and collaboration, positioning us among Europe's foremost research institutes.

We are committed to bridging the gap between complex scientific through diverse outreach activities. By translating our research into accessible language and engaging the community in scientific advancements, we emphasize the importance of investing in research for societal progress and well-being. These efforts not only strengthen our connection with stakeholders but also promote broader appreciation and engagement with science for the benefit of society.

Transcriptions, editing and layout:

These podcast episodes have been transcribed, translated, edited, and formatted for this magazine by **Jana Sendra Viscarro**.

"Cutting-edge science advancing at the frontier between Chemistry, Structural, Molecular and Cellular Biology, aiming to develop a more Precise Medicine for the future"

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