



*Science
Food
Health*



nutrition

2024

annual report



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Director, IMDEA Food Institute

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words from the director...

Nutrition is much more than the simple supply of macronutrients and micronutrients. Metabolism (catabolism and anabolism) is an intricate molecular game, tremendously regulated and complex, in which both the metabolites incorporated with the diet (nutrients) and the receptor system itself (us) participate based on each individual's own characteristics such as genetics or lifestyle. In other words, it is not only important what we eat (the proportion of nutrients, the quantities of mineral salts or sugars or the amount of antioxidants, among others) but also when we eat (adapting the intake to circadian cycles, as studied by chronobiology), who eats it (what is the genetic background of the individual, whose genetic variations will make him/her take better or worse advantage of the benefits of each diet), in what situation is eaten (referring to the fact that lifestyle influences the effects of food on the organism through epigenetic mechanisms that modify the genetic material without affecting the primary DNA sequence) or even why we eat (connecting food with the neurological system of well-being and reward).

NUTRITION HAS ALSO BECOME A DATA SCIENCE

All these questions constitute the essence of the discipline we know as Precision Nutrition (nutrition adapted to each individual according to his or her personal characteristics) and are the object of the research we carry out at

IMDEA Alimentación. We could say that, at the cellular level, the nucleus and the mitochondrion would be our main objects of research. The nucleus, as the system where the genetic material that is inherited is stored and which, in addition, can be modulated by epigenetic mechanisms. It is estimated that primary sequence variations, even among close individuals, can affect up to 0.1% of the genetic material, which means a few megabases (MB), i.e. millions of nucleotides, among which it will be impossible not to find genes and regulatory systems involved in metabolism. The epigenetic mechanisms, which are relatively stable marks that the environment (food, pollutants, lifestyle, diseases...) engraves on the genetic material, are even much more adjustable and complex to analyze.

On the other hand, the mitochondrion is a central organelle responsible for the cell's energy production systems and somehow organizes metabolic fluxes and the cellular oxidation state, among other processes.

However, as can be seen in the different papers and projects presented in the IMDEA Food Report, Molecular Nutrition goes far beyond the genetics of predisposition or protection against metabolic diseases or redox balance and ATP production. Fully integrated with these are such important mechanisms as the recycling of components through processes known as autophagy, the circulation of materials and components through cell membrane systems and, most notably, the production of vesicles (EVs, for Cell Vesicles or Exosomes) as an intercellular signaling pathway throughout the organism.

Just as the cellular and molecular mechanisms related to Nutrition cannot be simplified, neither can the Feeding of higher organisms be reduced to the Digestive System. Both the Immune System and the Nervous System are indisputably associated elements of the Nutrition process, and this relationship occurs in both directions: Nutrition directly influences immune health and neurological health, but also the state of the Immune System and the psychic state are drivers of the Nutrition process. And it would be unthinkable to forget the so-called "Additional Organ" of our organism, which is the Microbiota. The microbiome, i.e. the set of microorganisms (bacteria, viruses, archaea, fungi, parasites...) that coexist in our body (mainly in the digestive tract) not only collaborate with our digestion by producing enzymes and metabolites, but are genuinely capable of regulating our entire metabolism. The microbiota is of special interest in all nutritional studies because by nature it is dynamic, that is, the proportions and identities of the microorganisms that make up each community are variable, which makes it an unbeatable target to modify the metabolism through nutritional strategies, through compounds or foods that favor, for example, the presence of certain strains or beneficial taxa.

Health at the cellular level, known as homeostasis, has a direct impact on the overall health of the individual, which opens up new avenues of research. In this sense, foods are, in a sense, drugs capable of modulating the body's response and the metabolites that we are able to synthesize (together with the metabolites that our microbiota are capable of producing) are chemical mediators with the capacity to influence global health. Every link in this chain is important. At IMDEA Alimentación we try to study all stages of the process. Thus, we investigate the properties of the nutrients themselves and their individual components capable, for example, of regulating the function of certain cells of the immune system or improving the proportions of beneficial fatty acids, but we also analyze the effect of different diets and diets on specific situations such as obesity, aging or certain types of cancer. Our vision of Nutrition is global: we can only affirm that a diet is correct when

its effect is beneficial to health, and it can only be beneficial when it is integrated into a healthy lifestyle, which also includes the development of physical exercise and mental well-being.

This whole process takes place and can be observed at the molecular level, using so-called biomarkers. Our aim will always be to try to measure and quantify the state of health or the development of certain diseases by means of laboratory parameters, so that when we test the effect of a nutritional intervention we are able to measure the effect and obtain evidence-based conclusions. With the current development of molecular biology technologies capable of producing and processing massive amounts of data, strategies are shifting towards measuring multiple biomarkers in parallel, which will allow us to define more precisely, but also more complexly, the biochemical processes involved in nutrition and their impact on health. It is not surprising, therefore, that Nutrition Science has also become a science of data, which we generate on a massive scale, which we must guard and protect, but also exploit in all its value. Advanced biostatistics and the creation of deep analysis tools based on machine learning and Artificial Intelligence technologies are indispensable allies that are allowing us to unravel the complexity of the biochemical processes that are distorted when a health problem appears, when our energy balance becomes unbalanced or when, in situations of vulnerability such as aging and many others, we need extra contributions to maintain functional activity.

I recommend the reader of this Report - 2024 to make a detailed immersion in the projects, activities, groups and people that make up the Institute IMDEA Alimentación. The journey through this document will allow the reader to delve into the mechanisms that biomolecules trigger when they set in motion their mechanisms of action, to

**WE NOTE HOW
NUTRITION IS BECOMING
INCREASINGLY
IMPORTANT AS A
FACTOR IN HEALTH**

learn about important population studies in which to observe the effect of diet on many healthy parameters, to learn how pathological and immunological processes such as

inflammation can be regulated through metabolic mediators, how to try to improve the health of cancer patients or other vulnerable patients by intervening through personalized nutrition or how to think about a healthy aging of the senior population thanks to nutrition and the acquisition of healthy habits since childhood, and finally how to integrate the role of the microbiota in all these processes.

There is no doubt that the approach is complex, as is the balance between health and disease, both at the cellular level and at the level of the individual. However, we note with enthusiasm how Nutrition is acquiring an increasingly relevant and recognized role as a health factor beyond simple nutrition. This paradigm gives full value to the work we carry out at IMDEA Food and that we try to transfer to Society, the Productive Sector and the Scientific Community as a transversal axis of enormous importance to achieve the shared objective of advancing towards the well-being of people from all points of view.

We hope that when you read this content we have been able to awaken the same enthusiasm that IMDEA Alimentación's researchers and support staff show every day and that have made this Report possible.



La Nutrición es mucho más que el simple aporte de macronutrientes y micronutrientes. El metabolismo (catabolismo y anabolismo) es un intrincado juego molecular, tremendamente regulado y complejo, en el que participan tanto los metabolitos incorporados con la dieta (los nutrientes) como el propio sistema receptor (nosotros) en base a características propias de cada individuo como la genética o al estilo de vida. Es decir, no sólo importa lo que se come (la proporción de nutrientes, las cantidades de sales minerales o azúcares o la cantidad de antioxidantes, entre otros) sino *cuándo* se come (adaptando la ingesta a los ciclos circadianos, tal como estudia la cronobiología), *quién* lo come (cuál es el bagaje genético del individuo, cuyas variaciones genéticas le harán aprovechar mejor o peor los beneficios de cada dieta), *en qué situación* se come (referido a que el estilo de vida influye en los efectos de la alimentación sobre el organismo a través de los mecanismos epigenéticos que modifican el material genético sin afectar la secuencia primaria del DNA) o incluso *por qué* se come (conectando la alimentación con el sistema neurológico de bienestar y recompensa).

Todos estos interrogantes constituyen la esencia de la disciplina que conocemos como Nutrición de Precisión (una nutrición adaptada a cada individuo en función de sus características personales) y son el objeto de la investigación que desarrollamos en IMDEA Alimentación. Podríamos decir que, a nivel celular, el núcleo y la mitocondria serían nuestros principales objetos de investigación. El núcleo, como sistema donde se almacena el material genético que se hereda y que, además, se puede modular mediante mecanismos epigenéticos. Se estima que las variaciones de secuencia primaria, incluso entre individuos cercanos, llegan a afectar hasta un 0,1% del material

genético, lo cual supone algunas megabases (MB), es decir, millones de nucleótidos, entre los cuales será imposible no encontrar genes y sistema de regulación involucrados en el metabolismo. Los mecanismos epigenéticos, que son marcas relativamente

estables que el entorno (alimentación, contaminantes, estilo de vida, enfermedades...) va grabando sobre el material genético es aún mucho más regulable y complejo de analizar.

Del otro lado, la mitocondria es un orgánulo central responsable de los sistemas de producción de energía de la célula y de alguna forma organiza los flujos metabólicos y el estado de oxidación celular, entre otros procesos.

Sin embargo, y como se va a poder apreciar en los distintos trabajos y proyectos presentados en la Memoria de IMDEA Alimentación, la Nutrición Molecular va mucho más allá que la genética de predisposición o protección frente a enfermedades metabólicas o el equilibrio redox y la producción de ATP. Plenamente integrados con estos, se encuentran mecanismos tan importantes como el reciclado de componentes mediante procesos conocidos como autofagia, la circulación de materiales y componentes a través de los sistemas de membranas celulares y de forma muy notable, la producción de vesículas (EVs, por Vesículas Celulares o Exosomas) como vía de señalización intercelular a lo largo del organismo.

De la misma manera que los mecanismos celulares y moleculares relacionados con la Nutrición no pueden simplificarse, tampoco se puede reducir la Alimentación de los organismos superiores al Sistema Digestivo. Tanto el Sistema Inmune como el Sistema Nervioso son elementos indiscutiblemente asociados del proceso de Nutrición, y esta relación se produce en las dos direcciones: la Alimentación influye de forma directa en la salud inmune y en la salud a nivel neurológico, pero también el estado del Sistema Inmune y el estado psíquico son *drivers* del proceso de la Nutrición. Y sería impensable olvidarse del llamado "Órgano Adicional" de nuestro organismo, que es la Microbiota. El microbioma, es decir, el conjunto de microorganismos (bacterias, virus, arqueas, hongos, parásitos...) que conviven en nuestro cuerpo (principalmente en el tracto digestivo) no solamente colaboran con nuestra digestión produciendo enzimas y metabolitos, sino que son auténticamente capaces de regular todo nuestro metabolismo. La microbiota tiene un interés especial en todos los estudios de Nutrición ya que por

**LA NUTRICIÓN SE HA
CONVERTIDO TAMBIÉN
EN UNA CIENCIA DE
DATOS**

naturaleza es dinámica, es decir, las proporciones e identidades de los microorganismos que componen cada comunidad es variable, lo que la convierte en una diana inmejorable para conseguir modificar el metabolismo mediante estrategias nutricionales, a través de compuestos o alimentos que favorezcan, por ejemplo, la presencia de determinadas cepas o taxones beneficiosos.

La salud a nivel celular que conocemos como homeostasis tiene una repercusión directa en la salud global del individuo, lo cual abre nuevas vías de investigación. En este sentido, los alimentos son, en cierto sentido, fármacos capaces de modular la respuesta del organismo y los metabolitos que somos capaces de sintetizar (junto con los metabolitos que nuestra microbiota es capaz de producir) son mediadores químicos con capacidad de influir sobre la salud global. Cada eslabón de esta cadena es importante. En IMDEA Alimentación tratamos de estudiar todas las fases del proceso. Así, investigamos las propiedades de los propios nutrientes y de sus componentes individuales capaces, por ejemplo, de regular la función de determinadas células del sistema inmune o mejorar las proporciones de ácidos grasos beneficiosos, pero también analizamos el efecto de distintas dietas y regímenes alimentarios sobre situaciones específicas como pueden ser la obesidad, el envejecimiento o determinados tipos de cáncer. Nuestra visión sobre la Nutrición es global: sólo podremos afirmar que una alimentación es correcta cuando su efecto sea beneficioso sobre la salud, y sólo podrá ser beneficiosa cuando se integre dentro de un estilo de vida saludable, que incluya también el desarrollo del ejercicio físico y el bienestar psíquico.

Todo este proceso se desarrolla y se puede observar a nivel molecular, utilizando los denominados biomarcadores. Nuestro objetivo será siempre intentar medir y cuantificar el estado de salud o el desarrollo de determinadas enfermedades mediante parámetros de laboratorio, de forma que cuando probemos el efecto de una intervención nutricional seamos capaces de medir el efecto y obtener conclusiones basadas en la evidencia. Con el desarrollo actual de las tecnologías de biología molecular capaces de producir y abordar cantidades masivas de datos, las estrategias se están

OBSERVAMOS CÓMO LA NUTRICIÓN ESTÁ ADQUIRIENDO UN PAPEL CADA VEZ MÁS RELEVANTE COMO UN FACTOR DE SALUD

trasladando hacia las medidas de múltiples biomarcadores en paralelo, lo que nos va a permitir definir de forma más precisa, aunque también más compleja, los procesos bioquímicos que intervienen en la nutrición y su impacto en la salud. No es extraño,

por lo tanto, que la Ciencia de la Nutrición se haya convertido también en una ciencia de datos, que generamos de forma masiva, que debemos custodiar y proteger, pero también aprovechar en todo su valor. La bioestadística avanzada y la creación de herramientas de análisis profundo, basadas en tecnologías de *machine learning* e Inteligencia Artificial son aliados indispensables que nos están permitiendo desentrañar la complejidad de los procesos bioquímicos que se distorsionan cuando aparece un problema de salud, cuando nuestro equilibrio energético se desbalancea o cuando, en situaciones de vulnerabilidad como puede ser el envejecimiento y muchas otras, necesitamos aportes extra para mantener una actividad funcional.

Recomiendo al lector de esta Memoria – 2024 que haga una inmersión detallada en los proyectos, actividades, grupos y personas que integran el Instituto IMDEA Alimentación. El recorrido a través de este documento permitirá adentrarse al lector en los mecanismos que desencadenan las biomoléculas cuando ponen en marcha sus mecanismos de acción, permitirá conocer importantes estudios poblacionales en los que observar el efecto de la dieta sobre muchos parámetros saludables, aprenderá cómo se pueden regular procesos patológicos e inmunológicos como la inflamación a través de mediadores metabólicos, cómo intentar mejorar la salud de los pacientes de cáncer u otros pacientes vulnerables interviniendo a través de una nutrición personalizada o cómo se puede pensar en un envejecimiento saludable de la población senior gracias a la alimentación y a la adquisición de hábitos saludables desde la

infancia, y finalmente cómo se integra la función de la microbiota en todos esos procesos.

No cabe duda de que el abordaje es complejo, al igual que lo es el equilibrio entre salud y enfermedad, tanto a nivel celular como a nivel de individuo. Sin embargo, observamos con entusiasmo cómo la Nutrición está adquiriendo un papel cada vez más relevante y reconocido como un factor de salud más allá de la simple alimentación. Este paradigma da todo su valor al trabajo que desempeñamos en IMDEA Alimentación y que intentamos trasladar

a la Sociedad, al Sector Productivo y a la Comunidad Científica como un eje transversal de enorme importancia para conseguir el objetivo compartido de avanzar hacia el bienestar de las personas desde todos los puntos de vista.

Ojalá que cuando leáis este contenido hayamos sido capaces de despertar la misma ilusión que la que derrochan cada día los investigadores y el personal de apoyo de IMDEA Alimentación y que han hecho posible esta Memoria.





cor

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about us

The IMDEA Food Institute, one of the eight Madrid Institutes for Advanced Studies (IMDEA), is a public research centre founded in 2007 by Madrid's regional government. The goal of the Institute is to generate science of excellence in the field of food on which to support solutions to social problems and to contribute to a knowledge-based economic model capable of generating high added value.

MISSION

Generating scientific knowledge of excellence in the fields of food and nutrition, to improve the quality of life of the population and to contribute to the development of an economic model based on the creation of value from knowledge-based innovation.

VISION

IMDEA Food advances its lines of research through the strategies and tools of nutritional genomics, in fields such as cancer, ageing, obesity and cardiometabolic diseases.



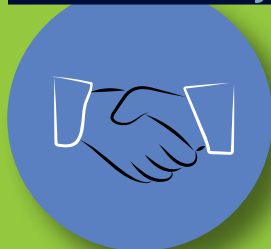
IMDEA Food organizes its activities around three strategic axes:

science



Advancing scientific knowledge in the areas of food and health, with a special focus on the prevention of chronic diseases.

industry



Powering the economic development and competitiveness of the food industry via the design and validation of nutritional strategies and food products to prevent and to treat chronic diseases.

society



Reducing of healthcare costs and improving the wellbeing of the population through the study of link between the diet and health, and the execution of communication and dissemination programmes.



The core strength of the Institute is its international **research team**, **consisting of talented researchers from 11 different countries**, which carries out new scientific discoveries in Food Science, and foster the development of emerging technologies.

The building and laboratories of IMDEA Food Institute are located at the Cantoblanco University Hospital, next to the Universidad Autónoma de Madrid campus, with which the Institute collaborates closely.

79 people

4.595 m² area

11 different countries

2 symmetrical areas
of 5 floors each

16 research groups

7 research labs



research programmes



Precision Nutrition
and Aging



Precision Nutrition
and Cancer



Precision Nutrition
and Cardiometabolic Health



Precision Nutrition
and Obesity



Childhood Precision
Nutrition

R+D+I Platforms and Technology Transfer



Clinical Platform
of Clinical Trials.
GENYAL



Innovation, Transfer
and Communication
Platform

organization structure





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in figures

human RESOURCES



80 People

16 Research Groups



46

researchers



14

associate
researchers



73

students



6

lab
technicians



7

staff
management

scientific RESULTS



187
Scientific
Papers

+75%

Cumulative
growth of impact
factor since 2018

70%

%Q1
JRC

16
Ongoing
Theses

32
Theses
since 2008

4
Theses
defended

projects & FELLOWSHIPS



+2,500 Clinical
Nutrigenomic
Volunteers
Cohort

51 Ongoing
Projects

31 R&D
Grants

23

National
Projects

18

Regional
Projects

6

International
projects

6

Contracts
with industry



technology TRANSFER



The Institute has a portfolio of nine patents, seven of which have been granted and three have been internationally licensed. Two patents have been also transferred to the company CANAAN through the granting of an exclusive license with the right to sublicense, develop, use and market the international patent PCT/ES2017/070263 and the Spanish priority patent number P201131733. Two products derived from the invention P201830740 have been licensed to the company YNSADIET. Also, IMDEA Food, participates

in two EBT (technology - based company) PRECISION FORHEALTH, S.L. (P4H) constituted in February 2018 and FORCHRONIC S.L. constituted in March 2019. Finally, the following shows the companies that have been collaborating with the centre during 2020, the agreements agreed with International Universities and Research Institutes, as well as the different scientific and technological international partnerships that IMDEA Alimentación has:

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Interventions**



Public institutions



Private institutions



Clusters



tribune

José María Ordovás

Director of the Precision
Nutrition and Obesity Program



NUTRITION, SCIENCE AND A NEW PARADIGM UNDER CONSTRUCTION

In recent decades, we have witnessed an unprecedented transformation in the way we understand the role of nutrition in human health. What was once considered a mere support for disease treatment has come to occupy a central place in prevention, public health and even clinical intervention efforts. From an international perspective, this evolution has not been homogeneous. In countries such as the United States, the United Kingdom and the Nordic countries, nutrition is firmly integrated into national health and aging strategies, and is considered part of the solution to epidemics such as obesity, diabetes and cognitive impairment. However, in Spain and other southern European countries, there is still a certain reluctance to recognize its full potential, despite having an enviable dietary tradition and highly qualified professionals.

Part of the problem lies in the still deep-rooted perception that nutrition belongs to the realm of common sense, and not so much to that of science. But it is enough to review recent literature to see that nutritional sciences have evolved into a complex, interdisciplinary and technologically advanced field. The emergence of nutrigenomics, nutritional epigenetics, metabolomics and microbiome science has placed nutrition at the heart of precision biomedicine. Today we no longer speak of a "balanced diet" as a universal recipe, but of personalized nutrition, adjusted to our genetic, metabolic and environmental characteristics.

In this context, the role of industry - both food and pharmaceutical - is as strategic as it is controversial. From the point of view of innovation, the food industry has begun to take an active role in product reformulation, the development of functional foods

and the incorporation of new analytical technologies. However, there remains a structural tension between public health objectives and economic imperatives. The pharmaceutical industry, for its part, has traditionally remained more distant from the nutritional world, but this barrier is rapidly eroding.

The emergence of GLP-1 analogs - molecules initially developed to treat type 2 diabetes, and today star therapies for weight loss - is a turning point. Drugs such as semaglutide and others like it have shown remarkable efficacy in reducing body weight, improving metabolic markers and even modulating appetite and eating behavior. But its impact is not only clinical: it is reshaping the therapeutic and social ecosystem around obesity, a problem that has so far resisted conventional solutions.

This phenomenon raises enormous questions: are we facing a paradigm shift in the treatment of obesity and metabolic syndrome? What are the implications of the massive and long-term use of these drugs in terms of health sustainability, equity of access and social consequences? Will this pharmacological approach displace preventive approaches based on diet, exercise and behavior?

In my view, GLP-1 analogues should not be seen as an alternative to nutrition, but as a complementary tool within a broader approach. In people with severe obesity or high metabolic risk, they can be a powerful aid in breaking pathological cycles and facilitating lifestyle changes. But if their use is trivialized, or if they are proposed as a shortcut for a healthy population but dissatisfied with their body image, we run the risk of undermining the educational, behavioral and social role that all health interventions should have.

This is where research and ethics must walk together. If I have learned anything in my career, it is that health is

not only a biological issue, but also a profoundly social one. Adherence to a healthy diet, the ability to engage in physical activity, the response to treatment or the simple fact of going to a doctor's office are mediated by cultural, economic, emotional and community factors. And if we do not incorporate this dimension into our health strategies, we will be designing incomplete solutions.

For this reason, the precision nutrition approach that we advocate at centers such as IMDEA Alimentación is not limited to deciphering the genome of each individual, but seeks to understand their biography, their habits, their values and their ties. Healthy aging, one of our great aspirations as a society, cannot depend solely on drugs or technologies, but on environments that favor well-being, equity and autonomy.

We are living in an exciting and delicate moment. Never before have we had so many tools to improve health at the individual and population level. But it is also true that the economic model, the digital environment and social polarization are creating new forms of vulnerability. Nutrition, in this sense, can and must be an articulating axis between biology and social justice. And the future of our societies will largely depend on whether we know how to integrate this vision in public policies, medical training, the food industry and, of course, in research of excellence.

As a scientist trained in Spain but with a career in the United States, I have seen how sustained investment in nutritional research has a direct impact on the quality of life of the population. Spain has the talent, tradition and potential to lead this field. But we need institutional conviction, stable alliances between academia and industry, and a narrative that returns nutrition to the place it deserves in the collective imagination: not as an imposition or a fad, but as a powerful science at the service of human beings.



in the MEDIA



EL PAÍS

Salud y Bienestar

LA SALUD VA POR BARRIOS · NUTRICIÓN Y CENIC · ENFORMATE · MONITOREAS RESPONDENOS · SALUD

ALIMENTACIÓN >

■ Crononutrición: “El cuándo comes es tan importante como el qué comes”

Un desfase entre el momento de las comidas y el reloj biológico del cuerpo humano eleva el riesgo de enfermedades, porque muchos órganos funcionan con horario



LA VANGUARDIA



“MILESTONE IN THE FIELD OF
CANCER THERAPIES: POSITIVE
IMMUNOLOGICAL EFFECTS
OF COMBINING FASTING AND
CHEMOTHERAPY”

DIARIO MÉDICO  CORREO
FARMACÉUTICO

ONCOLOGÍA IMDEA Alimentación

Ayuno, potencial aliado de la quimioterapia en el cáncer

El Instituto Madrileño de Estudios Avanzados (IMDEA) Alimentación está investigando cómo la combinación de ayuno y quimioterapia puede ayudar frente al cáncer.

LONGEVITY

Envejecimiento y obesidad: “La distribución del tejido adiposo corporal sí importa”



• El aumento de la adiposidad visceral (en el abdomen) es un fuerte predictor de mortalidad, pero el incremento de la subcutánea se asocia con una disminución del riesgo. Resumimos aspectos destacados de la relación entre envejecimiento y obesidad



El tipo de grasa que acumulas en el abdomen es un factor determinante. (Getty Images)



Afecta Díaz Ruiz
COORDINADOR DE RED · INVESTIGADOR PRINCIPAL



"THE EUROPEAN MENTORING PROJECT SEEKS TO REVOLUTIONISE THE TREATMENT OF CANCER PATIENTS AND IS BEING LAUNCHED UNDER THE LEADERSHIP OF IMDEA"

GACETA MÉDICA





“NEW

PHARMACOLOGICAL
TARGETS BASED ON
THE GUT MICROBIOTA”

THE CONVERSATION

Infosalus





rne



José María Ordovás, miembro del patronato de la FEN, ha sido distinguido con el título Doctor Honoris Causa por la Universidad CEU San Pablo.



REVISTA ALIMENTARIA

"PRECISION NUTRITION, A STRATEGIC FOCUS OF INNOVATION FOR THE FOOD AND HEALTH INDUSTRIES"

Se abren las puertas a nuevas dianas farmacológicas a partir del microbiota intestinal

Este exhaustivo trabajo acelera el conocimiento del papel de la microbiota y la generación de una nueva modalidad de fármacos y nutracéuticos para enfermedades cardiovasculares, el párkinson, el alzhéimer, enfermedades infecciosas o el cáncer

Un reciente análisis computacional desarrollado desde el Instituto IMDEA Alimentación ha permitido identificar una gran cantidad de proteínas humanas y bacterianas que están involucradas en la función de la microbiota de múltiples procesos biológicos para la salud, como los vinculados al sistema inmunitario, el metabolismo, la nutrición o el sistema nervioso. La información obtenida del estudio servirá para diseñar nuevos fármacos capaces de modular su actividad a partir de mecanismos que, hasta el momento, no se han explorado.

notiweb madrid

La Nutrición de Precisión, foco estratégico de innovación para las industrias alimentarias y de salud en la Comunidad de Madrid

IMDEA Alimentación
20 de febrero, 2024



**Gonzalo Colmenarejo**Cheminformatics
& AI Group Head

tribune

TARGETING THE GUT MICROBIOME WITH SMALL MOLECULES FOR THERAPEUTIC PURPOSES

The human gastrointestinal tract is home to trillions of microbial cells that, together with the host, metabolize the many external small molecules we ingest (food, environmental compounds, pharmaceuticals). The resulting compounds or “metabolites” establish signaling interactions with human and/or microbial proteins that regulate multiple biological processes of high importance for health. Accumulating evidence demonstrates that different diseases (e.g. inflammatory bowel disease, colon cancer, cardiovascular diseases, neurodegenerative diseases, etc.) are caused by the dysregulation of one or more of these interactions.

This growing knowledge has suggested the appearance of a new drug modality, that of small molecules mimicking gut metabolites, that by modulation of these dysregulated interactions are able to rebalance them and stop the disease condition. Its advantage over other gut-targeted therapies like fecal microbial transplantation, prebiotics, probiotics, or phages, lies in its specificity, reproducibility, knowledge of the mechanism of action, and well-established regulatory framework for approval. This new drug modality has the additional advantages of providing completely new chemotypes for drug discovery, and of allowing to use a largely expanded target space, the metagenome, about two orders of magnitude bigger than the human

genome. Examples include the design of inhibitors of xenobiotic nuclear receptors for inflammatory bowel disease, choline lyase inhibitors for cardiovascular diseases, and β -glucuronidase inhibitors to avoid diarrhea in colon cancer treatment.

However, identification of key interactions is very complicated, given the vast complexity of both the metabolite and target spaces, the difficulty in growing gut bacterial strains, and the isolation and structural elucidation of the metabolites.

In our group we use a pioneering combination of Cheminformatics and AI to accelerate the knowledge in this area. By applying virtual screening techniques we have expanded more than 4-fold the chemobiological space of interactions of the human gut metabolites, and have shared them openly so that they will facilitate the realization of fast, focused screens to identify novel interactions. On the other hand, we have also characterized the physicochemical and structural properties of the human gut metabolites, and developed Machine Learning models to predict gut permanence from molecular structure, a highly important property for future gut-targeted drugs in order to reduce toxicity and secondary effects. We have also performed a comprehensive analysis of the interactions the metabolites establish with their protein targets at the atomic level, and are using this information to develop new generative AI models for drug design of metabolite-mimetic inhibitors. Our application of Cheminformatics and AI in this field is therefore fostering the advancement of new small molecule-based therapies targeting the gut microbiome.



Year IN REVIEW



JANUARY

The words of researcher **Lidia Daimiel** serve as the headline for an article in **El País Salud**: When you eat is as important as what you eat. Focused on **chrononutrition**, on the relationship between eating patterns, circadian rhythms and metabolic health.

The Atlantic diet: key to lower mortality in Europe. A work of the **Group led by Fernando Rodríguez Artalejo** opens new possibilities for the development of nutritional guidelines adapted to this diet.

The researcher **Cristina M. Ramírez** participates in the forum organized by **IMIBIC in Córdoba** with the paper "Posttranscriptional regulation of metabolism and its implication for human metabolic diseases".

The director, **Ricardo Ramos**, as a member of the Jury of the **Madrid Alimenta Awards** organized by Alimenta Magazine, participates in this event where the potential of the agri-food sector in the Community of Madrid is evident.

Creation of the **IMDEA Alimentación for industry catalog** to reinforce the presence in **Science for Industry (S4i)** held in La Nave with science and innovation at the center of the program. We present new formulations, methodologies and approaches in Precision Nutrition or Healthy Aging to companies in the Health sector. Several contacts are made that have led to the creation of patents and spin-offs.

In **Florida**, **ILSI Global** brings together scientists at the forefront of nutrition research. Among them is the leader of the **Computational Biology Group**, **Enrique Carrillo**, to present the pioneering approach to microbiome data integration.

From the **Transfer Group** of the IMDEA institutes we organized the **first Entrepreneurship Workshop** so that researchers can learn in a practical way about business cases that have allowed the creation of spin-offs.

A component of **milk fat** may have **positive effects on cognitive impairment**. This is the result of the study in which we have participated with the **CIAL** and the **UNED CIAL_CSIC_UAM/UNED**, whose clinical trials have been carried out in the **GENYAL Platform**.

San Pablo CEU University has conferred an **honorary doctorate** on **José Ordovás**, without whose contributions modern nutrition and biomedicine could not be understood.

FEBRUARY

Course on Precision Nutrition and nutriomics with UPV-EHU directed by the director of the Precision Nutrition and Cardiometabolic Health Program, **Alfredo Martínez**, together with **Maria Puy Portillo**. Some other IMDEA researchers are also participating.

Meeting of the IMDEA Institutes Technology Transfer Working Group, where we presented some of the projects we are working on.

Presence at the CEOE and pharmaceutical industry forum where we discussed advances in cancer research, innovation ecosystems and public-private collaboration.

The principal investigator of the Epigenome Nutritional Control Group, **Lidia Daimiel**, is **interviewed in 'La Rosa de los Vientos'** of **Onda Cero** where she explains everything related to the synchronization of the biological clock and nutrition.

A series of **technical seminars** begin, in collaboration with different companies in the sector, to take on new processes at the Institute, the first of which is focused on Single Cell.

The Epigenome Nutritional Control Group led by **Lidia Damiel** publishes a **popular article on fasting**. It starts from scientific evidence to answer the 5 main questions. In just a few days, it accumulates more than 12,000 reads and crosses borders reaching BBC News.

We celebrated the **Day of Women and Girls in Science in different educational centers** of the Community of Madrid where some female researchers serve as inspiration for future generations.

The director, **Ricardo Ramos**, attends the **Awards given by the Community of Madrid** to recognize the trajectory of researchers. The Transfer Plan to bring science to society and initiatives in Deeptech are also announced.

We host an **Onboarding day of the SILO consultancy**, which reinforces its specialization in health and biotechnology to share innovation in these sectors. They know the pioneering equipment that have been recently incorporated.

In collaboration with **EDIH Madrid Region**, we participated from the Innovation and Communication Unit in a conference held at the University San Pablo CEU on **strategies for visibility, scientific positioning** and communicating research results.

The study carried out by the student **Victor López** to link microbiome, ultra-processed food and diet, using bioinformatics, has been recognized with the **Research Awards of the Ateneo de Granada and the Unicaja Foundation**.

Participation in the **AtheroNET meeting** where the research by Alberto Dávalos on how microRNAs can reduce cholesterol levels is presented. The Nutritional Control of the Epigenome group also exposes the association between #spermidine intake and #HDL functionality.

MARCH

First ALIPANC meeting with knowledge exchange with oncology experts from all over the country. Researcher from the **Molecular Oncology Group**, **Lara P. Fernandez**, provided an approach from Precision Nutrition for metabolic health in cancer.

Participation in one of the most important outreach fairs in the calendar, **Madrid Es Ciencia**, with a space where we offered almost 30 hours of activities. Experiments in the improvised laboratory, metabolic studies, competition for the best healthy menu or games to find out how to feed the research genes of practically all the groups.

Plenary meeting of the CITT-BIO cluster, where one of the speakers is the director, **Ricardo Ramos**, to address talent in the field of biomedical technologies and biotechnology. We will also discuss strategic collaborations, alliance building and financing.

We organized a **conference to analyze opportunities in Precision Nutrition and Health as a focus of Innovation**. In the same forum, we gathered MOIG, Madrid Open Innovation Group and the main agents of the food industry and research.

Presence in the Transfiere Forum, the largest event of the Spanish innovative ecosystem held in Malaga, which has allowed us to weave new alliances to continue working on the potential of the field of Nutrition and Health. This year **with an outstanding presence in the Research Center** and the presentation of the latest project in personalized medicine.

Reception of a Chinese delegation, composed of political leaders, businessmen and senior officials with a focus on foreign relations and mutual economic exchange. The meeting addressed the Hetao Shenzhen-Hong Kong Cooperation Zone. We want to strengthen collaboration.

The Time Change occurs in Spain and the researcher **Lidia Damiel** talks with **Antena 3 Noticias** about **Chrononutrition**, health and the timing of meals and biological processes that are governed based on schedules.

APRIL

The leader of the **Molecular Immunonutrition Group**, **Moisés Laparra**, tells the results of his research on the **consumption of nuts and seeds**, and their effects against diseases in **Alimento**, from **El Confidencial**.

Visit of future professionals from the biomedical sector who are studying this **degree at the Universidad Europea**, with which we are creating some lines of collaboration.

Researcher **Amanda Cuevas** presents the scientific evidence on **alcohol** in collaboration with the specialized supplement of **El Confidencial**.

Press release of a study that reveals how the **combination of fasting and chemotherapy** improves the **response against cancer**. These findings open new avenues to design personalized therapies that take into account hormonal factors.

The director, **Ricardo Ramos**, presented the research based on genetics, lifestyle and dietary interventions at **Expo Food Tech** to advance **Healthy Aging**. It is carried out in collaboration with **EIT Food** and in this forum several meetings are held with agents of the sector.

We attended the **Innovation Summit** focused on **entrepreneurship** where the innovative Captoplastic solution to control microplastics in bodies of water won the EmprandeXXI Awards.

Once again this year we have been able to witness the most disruptive proposals at the **Mad Blue Summit** as part of the **Jury** and **María Jesús Latasa** has evaluated the startups in the Food vertical.

MAY

The researcher **Enrique Carrillo** participates in the **I Conference on Primary Care Research at the Hospital La Paz**, moderating the table of elderly population. Among other topics, opportunities in epidemiological research on aging are discussed.

News on aging and obesity in La Vanguardia, where the leader of the Cellular Gerontology Group, Alberto Díaz, contributes his knowledge about the increase in **visceral adiposity** (in the abdomen) is a strong indicator of mortality, but the increase in subcutaneous adiposity is associated with a decreased risk.

Article in the specialized journal Oleo to address the underestimated benefits of conviviality and commensality in the **Mediterranean Diet**, in collaboration with the University of Bari "Aldo Moro" and the University of Padua.

On the eve of Europe Day, **MADRID NIGHT** starts at the headquarters of the **Madri+d Foundation**, where we participate with our own program in collaboration with this foundation and the European Commission.

Students of Human Nutrition at the University of Cordoba come to know the research lines and facilities of IMDEA Alimentación. We have shown them the latest strategies to advance in the relationship between diet and genes.

Our researcher **Edwin Fernández**, also collaborator of UNIR, intervenes in **La Sexta Noticias** to talk about the correct **order when eating food**.

The **InnoDays Madrid** are back and they start looking at the **Food Tech** sector. We participate to talk about how we work "from the cloud to the plate". The director, **Ricardo Ramos**, together with the researcher **Enrique Carrillo** provide the vision of the world between the scientific paper and the product. **of intelligent innovation in Precision Nutrition**.

Misinformation is an increasingly relevant social problem. Quick, not to say impossible, solutions to health issues are spread in the digital world without any scientific evidence. To learn how to detect them, recommended **article** in which the researcher **Alberto Díaz-Ruiz** participates.

<https://t.co/jjmVZUbmEO>

We participated with the **Researchers at School** program in the **STEM Castiza** at the **Gonzalo Fernández School in Córdoba**. Equal parts fun and learning with the workshops developed by the group led by Enrique Carrillo, from making your own cell to the effects of food on health.

Productive discussion at the **Symposium at ETSIAAB**. Contribution of the researcher **Lidia Daimiel** to design and implement more effective policies in the fight against **obesity**, from the role played by our genes.

UNIR University conference focused on the **latest advances in Health and Nutrition**. The director, **Ricardo Ramos**, participates with a full panel of experts.

Ricardo Ramos attends the **Biomedical Research 2024 event in Barcelona** with the support of AseBio. Much has been said about innovation and, above all, about the role of research in building more modern healthcare systems with a greater capacity to improve people's quality of life.

As part of the internal **Training Plan**, a session focused on **Equality**, from a broad approach and as a strategic principle of corporate and HR policy. An awareness-raising guide is available.

JUNE

Together with the rest of the **IMDEA institutes**, we attended the **South Summit 2024** to talk about science and innovation with the presence of the General Director and the Vice-Minister of Universities, Research and Science of the Community of Madrid.

That same day we were also present at the second edition of Villa Gourmet and, more specifically, in the **space dedicated to innovation in the food sector**. Organized by the Factoría de Villaverde and the Madrid City Council.

A team led by the director of the Nutrition and Cardiometabolic Health Program, Alfredo Martínez, participate in the **XXXIII Congress SEN2024**. Our researchers have been present throughout the scientific program, with special mention for the session where we have brought to Granada the latest advances in **Precision Nutrition**.

The **head of the Epidemiology Group**, Professor **Rodríguez-Artalejo**, appointed **scientific director of this area in CIBER ISCIII**. And **Mercedes Sotos**, from the same team, **best young researcher in Medicine at UAM Madrid**.

The manager **Alejandro Arranz** has been one of the guests at the **conference of the Community of Madrid**, where he has contributed his experience in instruments and research applied to **innovation**.

Ricardo Ramos attends the **Margarita Salas Foundation conference** to listen to inspiring women who continue the legacy of a pioneer in science and bet on STEM vocations.

Days of shared knowledge at the **Congress of the Spanish Society of Geriatrics in Malaga**. In our case, focused on healthy aging with the **presentation of Alberto Díaz-Ruiz**, where he presented therapeutic options linked to microbiota and longevity.

We are in **Montreal**, at the **International Conference on Intelligent Systems for Molecular Biology**, where researcher **Adrián Martín Segura** will present **NUTRiclock**, the #microbiome-based aging clock that uses neural network algorithms.



JULY

Few **hospital centers** have the **services of dietitian-nutritionists**, professionals specialized in a factor that can be decisive in the treatment of many diseases: nutrition. Analysis by researcher **Amanda Cuevas** in *The Conversation*.

Visit of the **Regional Minister of the Community of Madrid, Emilio Viciano**, during which he was able to see the expansion of facilities and new equipment, and the research in Precision Nutrition that allows progress in the **prevention and treatment of diseases such as cancer or diabetes**.

IMDEA Food's new European initiatives announced today to improve the quality of life of patients with cancer or diabetes are focused on these approaches.

Participation in the **International Congress on Health and Aging CLISE in Murcia**. Research, health and aging in the same forum, where we have promoted a **symposium** focused on the microbiota interventions that we carry out for healthy aging.

The **IMDEA Institutes Technology Transfer working group** met again, this time at **IMDEA Water**, where they were able to see the infrastructures and learn from the researchers about the projects that are currently being developed at the institute.

Lorena del Pozo was awarded the **Extraordinary PhD Prize in Biology by the Autonomous University of Madrid**. This thesis was directed from the group of Epigenetics of Lipid Metabolism and deals with such a current topic as food extracellular vesicles.

On **Grandparents' Day**, we disseminate the **new study of physiological mechanisms to achieve Healthy Aging**, one of the challenges that occupy our time and that is none other than to live healthy years.

Four projects of as many researchers and groups, selected in the **national plan of Knowledge Generation of the State Research Agency**. Effects of nanoparticles; microbiota and plant-based diets; new therapies for aging; and neurological-intestinal health are the areas on which the research will focus.

Approval of the creation of the Interministerial Committee to reduce childhood obesity. The National Strategic Plan for the Reduction of Childhood Obesity (2022-2030) includes 200 measures to improve the health of children and adolescents.

AUGUST

Results of research focused on chronic kidney disease by the **Epidemiology Group** are published, associating higher protein intake with reduced mortality in mild to moderate cases in the elderly.

IMDEA Institutes joined the **Night Madrid** project with the activity we organized at the Residencia de Estudiantes in **Madrid "Science that helps the Planet. Science, what would we do without you?"** We recorded a new video format for the dissemination of this celebration starring the researcher **Laura J. Marcos**.

Following the **publication in Nature** on the **'keto' diet** in improving the results of a drug against pancreatic cancer in mice, **Science Media** and our researcher **Alberto Díaz-Ruiz** offer more keys to the interactions between nutrition and drugs that are also published in **Expansión**. "Precision nutrition must be integrated into clinical practice to improve the efficacy of cancer treatments".

We bid farewell to the students who are finishing their stay at IMDEA Alimentación. As an example, one of them is the Italian **Cristiana Mignogna**, PhD from the Human Nutrition Group of the University of Parma, during which time she has advanced in the knowledge of statistical techniques to be applied in the nutritional field.

The **article by pre-doctoral researcher Isabel Fernández Carrasco** on the diversity of molecules present in poisons, **finalist of the Dissemination Award** organized by the Lilly Foundation in collaboration with *The Conversation*.



SEPTEMBER

The principal investigator of the Venomics Group, **Maria Ikonomopoulou**, returns from the 11th **Aging Research and Drug Discovery Meeting**, where the challenges of age and disease were discussed. In Copenhagen, both this researcher and the Director of the Nutrition and Aging Program, Rafael de Cabo, presented the latest pharmacological findings to improve health and a new class of xenolytics of animal origin.

A new academic year begins and we continue in different activities. In **NuGOweek**, researcher **Laura J. Marcos** presented how to use networks to unravel microbial associations according to body composition and disease prevalence.

We are preparing several **projects** for the **public-private collaboration project grants** for research, development and innovation promoted by the **Community of Madrid**.

Registration is open for the European Researchers' Night and we offer a full program of activities for young people to become the best research assistants in Nutrition and Health for a day. This year we have prepared a scientific circuit to test the technique in a small laboratory, solve a real case of food alert and fun games, workshops and experiments.

At the Royal Academy of Pharmacy, **Ricardo Ramos** and **Alfredo Martínez** attend a **scientific conference** to learn more about how **Artificial Intelligence** and, in general, innovation are being integrated into the healthcare panorama.

Predoctoral researcher Blanca Lacruz has presented the latest results of the **AI4Food project**, using AI for the prevention of chronic diseases from the **#PrecisionNutrition** approach. It has been in the **ECCB 2024 Congress**, where it has been well received.

We participate in different working tables of the recently created Agri-Food Cluster Madrid Food, where we will contribute with our experience in research and health.

On World Cancer Research Day, an **article by the director, Ricardo Ramos**, was published in the latest issue of the **magazine Alimenta**, where he discusses the revolution in genome management and the possibilities that are opening up.

We attended **EuroQSAR**, one of the largest scientific events in Chemoinformatics. The team led by Gonzalo Colmenarejo presents its work on microbial metabolites as a source of new drugs and food compounds to understand their impact on health.

At IMDEA Alimentación's headquarters, interest in science is in the air with the **celebration of the European Researchers' Night**. In this edition we received the visit of the Councilor of the Community of Madrid, Emilio Viciano, who refers to this day as the best way to awaken scientific vocations. About 200 young people participate in this day dondn the laboratory and approach the **#Nutrition of the future**, from what happens to unveil the secrets of **#DNA** to what lies behind a nutritional study.

OCTOBER

Development of a **nutritional intervention study** from the GENYAL Platform that seeks to improve the **quality of life in women** during menopause.

Gilead Sciences Fellowship Ceremony, which brought together many of the awardees in its 10 years. Among them, the researcher **Alberto Dávalos**, who was recognized for his advances in the Biomedical area.

The **Nobel Prize in Physiology or Medicine 2024** has been awarded to Victor Ambros and Gary Ruvkun for **the discovery of microRNA** and its role in the post-transcriptional regulation of genes. We now know that there are more than a thousand genes for different microRNAs in humans and that gene regulation by microRNAs(discovered by this year's Medicine laureates) is universal among multicellular organisms.

A relevant study on **aging and life expectancy** is published in **Nature**. Given its scope, researcher Alberto Diaz-Ruiz collaborates with **Diario Médico** to get to the bottom of the findings and data.

The **European project MENTORING** is launched to revolutionize the treatment of cancer patients with the participation of 6 leading research centers and 4 million euros, with funding from the European Commission (PathFinder). It aims to create a comprehensive Precision Nutrition model to improve the nutritional and metabolic status of lung cancer patients by making use of multi-omic approaches, which could transform the current healthcare landscape.

Days of work and collaborative learning in **Santander** with **EIT Health** where **María Jesús Latasa**, from the Innovation Unit, has been present. Matchmaking and Open Innovation to drive the digital transformation of Healthcare, in our case with focus on the personalization of therapies

A study by **UAM and IMDEA Alimentación** (Epidemiology Group) reveals that poor **sleep patterns in older adults** are associated with an increased risk of mortality.

The **Innovative Companies Forum** recognizes **Daniel Ramón** with the **Innovative Researcher Award**. Specializing in the field of food biotechnology, he is the Chairman of the Board of Trustees of the IMDEA Food Foundation.

On **World Food Day**, we launched the message on IMDEA Alimentación's official channels that our habits today determine the future health of every person and the planet.

A team from IMDEA Food participates in different spaces in the **Next Bite in Rome**, one of the biggest events of **EIT Food** where the latest projects and patents have been presented, among other lines in the field of innovation.

Active participation in the **first SEBIBC Congress** of the team led by **Enrique Carrillo** in round tables and presentation of the most relevant advances in the field of **Bioinformatics**.

Ricardo Ramos shares his approach to **Precision Nutrition** at the LWF in Alicante. Interviews in various media and supports: "Everything to do with health starts from the individual's own genetics".

We create **new formats for the dissemination of science** and in this case linked to the European Researchers' Night. What happens when a researcher and a student sit down to talk?

Press release to the media of the study that opens the door to **new pharmacological targets based on the microbiota**. The group of researchers, led by Gonzalo Colmenarejo, has identified a large number of human and bacterial #proteins.

NOVEMBER

How to age with health? This is the question with which we start the **activities of the Science Week in Madrid**, thinking especially in the senior population and also in its connection with the younger ones. We are committed to a Science capable of uniting generations.

Interview with Alberto Díaz-Ruiz in Telemadrid/Onda Madrid with Nieves Herrero. "We are able to modulate aging with nutritional interventions".

Obesity and diabetes: the yin and yang of glucose. Article in **The Conversation** by researchers from Universidad Complutense and Imdea Alimentación.

The Computational Biology team attends the **dEFFoST 2024 Congress** where they analyze the food systems of the future. In addition, predoctoral researcher **Blanca Lacruz** is nominated for the **student of the year award by popular vote** in Bruges for the AI4Food project.

At the **ASEICA Congress**, the head of the Metabolism Unit, **Marta Gómez de Cedrón**, presented the results of the trial with a #bioactive formulation rich in phenolic diterpenes for application in oncology patients. A reference forum to continue sharing research against Cancer.

Chemoinformatics, AI and Food Chemistry to help our health, are the topics of the article in **The Conversation** by Gonzalo Colmenarejo and Andrés Sánchez, researchers at IMDEA Alimentación.

New **Thesis** defense by **María Castejón**, who is now a **new PhD** with Outstanding and the great applause of the audience that filled the center. She has done it with a work based on the **biological processes of aging** and its implications in Public Health.

On World Children's Day, **Ricardo Ramos** attends the meeting of the **Fundación Occidente** to address from different points of view how to **prevent obesity**. Interesting contributions from speakers to complement our studies at the molecular level.

Days of knowledge exchange in **Seminars & Talks**. With **Erika Sierra** PhD, from the University of Guadalajara (Mexico) on Precision Nutrition strategies based on the latest genomic studies and Professor **Daiana Silva** from UFBA, in Brazil, with her experience in the field of Venomics, animal toxins as a source of treatments for diseases such as cancer.

Seniors and schoolchildren shared a unique experience: putting themselves in each other's shoes with one of the most special activities of Science Week, uniting generations and opening the door to new perspectives.

DECEMBER

We participated in the **'Conecta' event of the regional Agri-Food Cluster** of which we are part and which is celebrating its first year. It is held at the Telefónica Foundation Space and is attended by Ricardo Ramos and Moisés Laparra. All the agents in the food chain joined forces to boost competitiveness.

Iberoamerica-Madrid connection with the conference we organized in collaboration with the Impact Innovation Hub of the Madrid City Council: **Puentes de Talento (Talent Bridges)**. A working meeting where young talents and entrepreneurs came to Madrid to immerse themselves in the most innovative ecosystem and in the projects of our scientists and researchers.

With the research of the Institute in Precision Nutrition and Health, the director, **Ricardo Ramos**, was one of the speakers at the opening of the **forum for the food and marine industry in Vigo** organized by ANFACO-CECOPESTCA, the Xunta de Galicia, the Ministry and the University of Vigo, among others.



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WHAT WE DO?

The Madrid Institute for Advanced Food Studies focuses on developing scientific research of excellence in the field of nutrition and precision nutrition to promote solutions that benefit society and its health, and thus contribute to a knowledge-based economic model that can generate high added value.



Precision Nutrition and Aging Programme

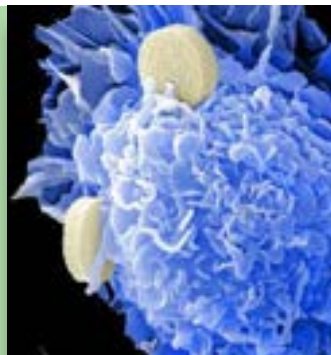
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Precision Nutrition and Cancer Programme

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Childhood Precision Nutrition Programme

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RESEARCH PROGRAM

Precision Nutrition and Aging

Goal and vision

The Precision Nutrition and Aging Program at IMDEA Food focuses on the multifaceted connections between nutrition and the aging process. Our program takes advantage of multiple models of age-related metabolic diseases, including cardiovascular disease, non-alcoholic fatty liver disease, obesity, neurodegenerative diseases, hepatic regeneration or diabetes. We are also studying how different nutritional interventions slow down the aging process and delay age related diseases, such as calorie restriction, intermittent fasting or different fasting-mimicking bioactive products.

Finally, our research is focused on the molecular mechanisms that regulate metabolic pathologies and aging-delaying interventions, ranging from mitochondrial function, miRNA expression, insulin signaling, senescence or exosome production and function. Together, we cover a wide range of molecular approaches to fight aging through nutrition.

Nutritional Interventions

- Development of Viable Interventions to preserve function until late in life.
- Study of Daily Eating Patterns to modulate energy demand and cellular energetic metabolism.
- Characterization of circulating factors in the aging process.

Cellular and Molecular Gerontology



We aim to support healthy aging via interdisciplinary research. By integrating research advances in biology, medicine and technology, we aim to identify healthspan-promoting and lifespan-extending interventions. By uncovering molecular signatures and therapeutic targets, we develop innovative strategies to reshape aging trajectories, with special emphasis on individuals impacted by age-associated metabolic imbalances. Beyond research, we are committed to translate scientific innovation into accessible information for older individuals.

- Repositioning Existing Drugs to Target Aging and Cancer as Inter-related processes.
- Microbiota and AI-driven approaches to Promote Healthy Aging.
- Discovery of Molecular Signatures linked to Premature Aging.
- Connecting Older Adults with Innovative Scientific Advances.

Posttranscriptional Regulation of Metabolic Diseases



- Non-coding RNAs and RNA Binding Proteins in Aging
- Posttranscriptional Regulators as molecular link between Diabetes, Obesity and Alzheimer's Disease. Targets of Insulin Resistance, Mitochondrial dysfunction and Autophagy.

- Role of non-coding RNAs and RNA Binding Proteins in the regulation of glucose homeostasis and their implication in Diabetes, Metabolic Syndrome and Obesity.
- Potential effect of Aging on endothelial dysfunction and Atherosclerosis: Role of Caveolin-1.

Transactional Venomics



The Translational Venomics Group is dedicated to establishing venoms as a unique and valuable therapeutic source for drug development. We pioneer sustainable and ethical methods to harness the therapeutic potential of animal venoms, exploring them as innovative drug candidates and precision tools to address ageing and ageing-related diseases. Leveraging our diverse venom biobank, we aim to revolutionize the treatment of these conditions through safe and effective venom-derived therapies, ultimately improving patient outcomes and quality of life.

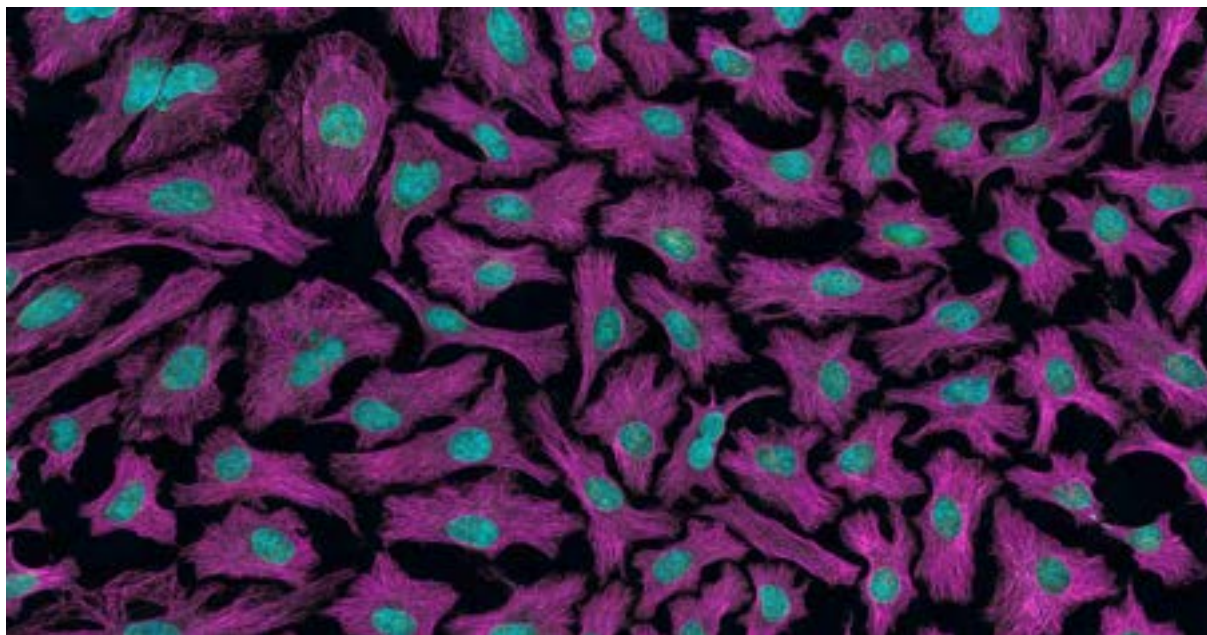
Cancer, closely associated with ageing, is a leading cause of death worldwide. The World Health Organization (WHO) projects that by 2040, the global burden of cancer will rise to 28.4 million new cases annually, primarily due to ageing and population growth. Ageing contributes to increased cancer risk through cellular damage (senescence), genomic instability, and immune system decline. Animal venoms, with their diverse pharmacology and chemical complexity, offer promising new drug candidates and tools to study physiological functions and pathological conditions.

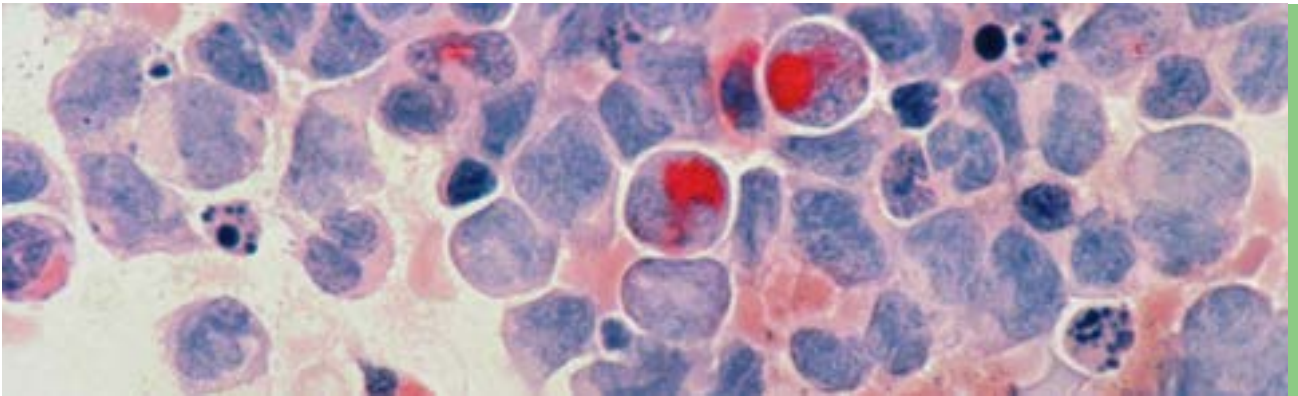
Our research focuses on discovering and characterizing bioactive venom compounds to understand the molecular bases of ageing and cancer. We aim to identify, optimize, and develop venom compounds as lead candidates or drug scaffolds for anticancer (e.g., melanoma with BRAF mutation) and anti-ageing (e.g., senolytics) therapies. To achieve these goals, we employ multidisciplinary approaches, including molecular and cell biology, advanced venomomics, animal models (mouse, zebrafish, worm) of cancer, obesity, and chronic diseases, as well as medicinal chemistry and structure-activity relationship studies.

- To expand and curate a unique Animal Venom Biobank, comprising around 500 venoms and compounds, and screen it to identify venom-derived peptides with broad therapeutic and biotechnology potential.
- To investigate the anticancer potential of animal venom-compounds, focusing on spider (gomesin) peptides as lead candidates and drug scaffolds. This includes studying their molecular mechanisms in BRAF human melanoma and other cancers and exploring their therapeutic potential against Devil Facial Tumor Disease (DFTD). Our research aims to develop venom-derived anticancer

therapies through international collaborations and advanced state-of-the-art techniques.

- To investigate the biology of quiescent BRAF mutated cancer cells using an octopus peptide (Octpep-1). This research aims to understand the molecular mechanisms of persistent cancer cells formed during therapy, contributing to drug resistance and tumor recurrence. We explore Octpep-1's effects in melanoma and other cancers, and its potential in combination with FDA-approved treatments, through advanced molecular and in vivo studies.
- To explore the senolytic activity of venom-compounds for treating ageing and ageing-related disorders. This includes characterizing marine venom-derived protein TVS1 and its enhanced version TVS1G, studying their effects on senescent cancer cells and ageing, and assessing their therapeutic potential in Hutchinson-Gilford progeria syndrome. Our research aims to develop venom-based therapies through high throughput screening, molecular, computation and pharmacological studies, and collaborations with international experts.





RESEARCH PROGRAM

Precision Nutrition and Cancer

Goal and vision

Without any doubt, cancer is a major burden affecting health at a global scale. Pharma companies invest millions of dollars and every day new developments and approaches are giving promising responses, but global success is still far out of reach. Some of the reasons for the partial efficiency of some therapies lays in the genetic differences between patients, a concept which is tackled by the so-called Precision Medicine strategies. Precision Medicine tries to classify and predict individual responses of patients according to their genetic background, accommodating treatments and processes to the individual characteristics of any of us. Thus, the ability to generate, classify, process and exploit genetic data arises as a powerful tool able to provide insight and clues which help to prevent, treat or control cancer progression. In parallel to genetic data, recently it has been well recognized that cancer is not just a question of cell growth or inhibition. Cancer cells exploit cellular mechanisms and can re-programme cellular pathways, avoiding the surveillance of immune cells and affecting the

traffic of cellular nutrients in their own benefit. In this sense, cancer is currently viewed as a metabolic and immunologic disease, and mechanisms devoted to reinforce immune processes and revert the normal metabolism of patients are promising tools which will be added to pharmacologic approaches used in cancer treatment.

Noteworthy, the mechanisms that are affected by cancer progression find interesting points of convergence with some other non communicable pathologies, such as obesity or fragility conditions associated to ageing. The program of NP&Cancer tries the mechanisms of cancer progression and dissemination, trying to find better biomarkers for the different stages of the disease and exploring the potential of nutritional strategies as relevant tools useful to modulate the metabolism of patients at a molecular level.

Molecular Oncology



The main objective of the group of Molecular Oncology within the Nutrition Precision and Cancer is to generate a real impact on the handling and outcome of cancer patients. With a major focus in lung, pancreatic and breast cancer but extended to some other types as well, our strategies are focused in using nutrition and metabolism as helpful adjuvants to modulate the mechanisms exploited by cancer cells during growth and dissemination. A major scheme in our group is to forge a close alliance with oncology departments within hospitals, so our projection and capacity to have a real health impact are at hand. Our effort is using scientific evidence, the generation of complex systemic data and latest-generation bioinformatic modelling to create knowledge and connection between patients and professionals, to find better treatments for cancer patients by the integration of multiple layers and approaches.

- **Multidimensional characterization of cancer patients.** Metabolic and immune alterations in cancer: identification of new biomarkers and therapeutic targets. We are especially interested on identifying metabolic, immune, genetic and metagenomic profiles associated to disease progression and treatment responses. From in-vitro cell systems, organoids and organ on a chip models to in vivo clinical trials in cancer patients, we investigate on metabolic and immune molecular pathways susceptible of being modulated by precision nutrition strategies to potentially improve Quality of Life of cancer patients.
- **Metabolic health in cancer.** We are interested in common molecular mechanisms which link cancer with other non-communicable diseases such as obesity, dyslipidaemia, dysbiosis, immunosenescence or meta-inflammation. We investigate the innate and adaptive immunity as key mediators of metabolic re-programming in cancer progression. We are especially interested on the role of lipids and other metabolites in the tumour microenvironment (cholesterol, lipids and one-carbon metabolites) and their contribution to the metastatic niche.
- **Precision nutrition strategies in cancer and other metabolic disorders.** Analysis of the activity and mechanism of action of bioactive compounds and natural extracts as possible effective dietary supplements in the prevention and treatment of cancer and metabolic chronic diseases and conditions such as sarcopenia and cachexia. The objective is to establish the scientific basis for precision nutri-

tion strategies in oncology and other pathological or physiological situations and to incorporate the concept of Quality of Life as one of the main targets for Nutrition.



Clinical Oncology

Our Clinical Oncology Group, with the Precision Oncology Laboratory (POL) in Hospital Universitario Infanta Sofia, is focused on translational research in lifestyle habits and related targeted interventions that can impact on cancer outcome, and on patients and survivors quality of life. In 2021 an structured pathway to engage cancer patients in physical activity and exercise programs has been set up with these goals, with a multidisciplinary team -including qualified exercise professionals, rehabilitation, oncologists, psychologists nurses and nutrition experts- and a net of local community exercise and sport resources. Main tumors of interest are lung, breast, and gastrointestinal cancer, with an anticipated new specific focus on neuroendocrine tumors based on center experience that has resulted in the second national center gaining european certificate as Center of Excellence (ENETs-CoE). Also to these objectives, engineers have been incorporated to build Real World Data and clinical management resources.

- Clinical trials and application of molecular nutrition strategies for improvement of response to treatments and quality of life of cancer patients.
- Identification of molecular biomarkers of cancer prognosis and treatment response.
- Development of electronic tools for clinical management and research.

THYROID CANCER RESEARCH LINE

Study the role of HIPPO pathway in thyroid tumorigenesis and progression.

- Study mechanisms of drug resistance.
- Determine the players and their role in tumor microenvironment.

Molecular Immunonutrition



The immune system is our main defense, not only against cancer and infections, but also against certain food ingredients. This relationship between the immune system and food is bidirectional, as nutrients and other food ingredients condition and direct the immune response. Our understanding of the immune system's role in regulating our body's use of nutrients continues to advance. In the future, the impact that cancer may have on the body will be determined by our ability to identify and implement precision immunonutritional strategies, which, combined with pharmacological therapies, will determine the body's susceptibility and response.

- To identify food ingredients with immunonutritional potential by defining their molecular mechanism
- To characterize the immunonutritional response from an 'omics' perspective for the development of precision nutritional strategies
- To develop processes of transferability and translatability of food ingredients, making them accessible to society

Computational Biology



We are at a pivotal moment in biomedical and societal evolution, shaped by the widespread acceptance and disruptive integration of artificial intelligence, big data, and biotechnology. These forces are not only transforming how we understand and treat disease, but also redefining our approaches to health, lifestyle, and longevity. Within this landscape of accelerated change, the growing recognition of nutrition as a cornerstone of health optimization and chronic disease prevention is more critical than ever.

The Computational Biology Group at IMDEA Food contributes by designing and applying advanced computational frameworks, spanning machine learning, AI-driven analytics, and systems biology modeling, to interpret complex, multimodal biological data related to diet, microbiome, metabolism, lifestyle, and aging. Our work enables a new era of data-informed, individualized nutritional strategies with real-world impact.

Our group operates at the intersection of computational biology, bioinformatics, nutrition science, systems biology and translational research. We harness large-scale omics data, digital and biological biomarkers, and AI technologies to build models that guide nutritional recommendations tailored to individual biology. Our long-term vision is to transform the way precision nutrition is understood, developed, and implemented by integrating computational technologies, experimental models, and public engagement. Our ambition is to serve as a European nexus for collaboration, research and innovation in precision nutrition, translating complex biological data into health-optimizing solutions.

To advance precision nutrition through the development of computational, molecular, and translational tools that characterize human variability in response to diet, with a focus to build actionable models on chronic disease prevention and healthy aging.

1. Scientific excellence in precision nutrition and computational biology

We generate foundational knowledge to understand how diet, nutrition, microbiome, metabolism, and aging interact to shape health outcomes. Our work integrates multi-omics data, AI and systems biology based modeling, and 3D in vitro systems. Key examples include the CD3DTech-CM project (organoid-based screening in non-responsive celiac disease), AI4Food (AI technologies for dietary monitoring and chronic disease prevention), NUTRIClock (AI and microbiome tools for healthy aging), and publications in *Gut Microbes*, *Clinical Nutrition*, *Database*, *Frontiers in Microbiology*.

2. Innovation and technological transfer We translate scientific insights into real-world applications through digital tools, platforms, and spin-offs. We co-founded **Microsei Biotech**, a spin-off focused on microbiome-based health solutions, and developed **Foodrugs**, a bioinformatics platform for analyzing food-drug interactions recognized by the EU Innovation Radar. Our group contributes to innovation ecosystems through European and regional projects such as FNS-Cloud and EIT Food.

3. Citizen science and societal engagement We actively involve the public in our research through co-creation projects like *Picture your Microbes*, educational games like *Bichindario*, and outreach activities in schools and public events including *Science Week*, *European Researchers' Night*, and *Madrid es Ciencia*. These initiatives promote scientific literacy, support participatory research, and bring science closer to society.

4. Education and training of future professionals We are committed to training the next generation of interdisciplinary experts who integrate data science, systems biology, molecular biology, and nutrition. We host national and international students for BSc and MSc thesis projects, and train early-stage researchers through doctoral programs (FPU, industrial PhD, etc.) and postdoctoral fellowships (MSCA, Juan de la Cierva, among others). Through these activities, we contribute to building a skilled workforce in data science and precision nutrition.

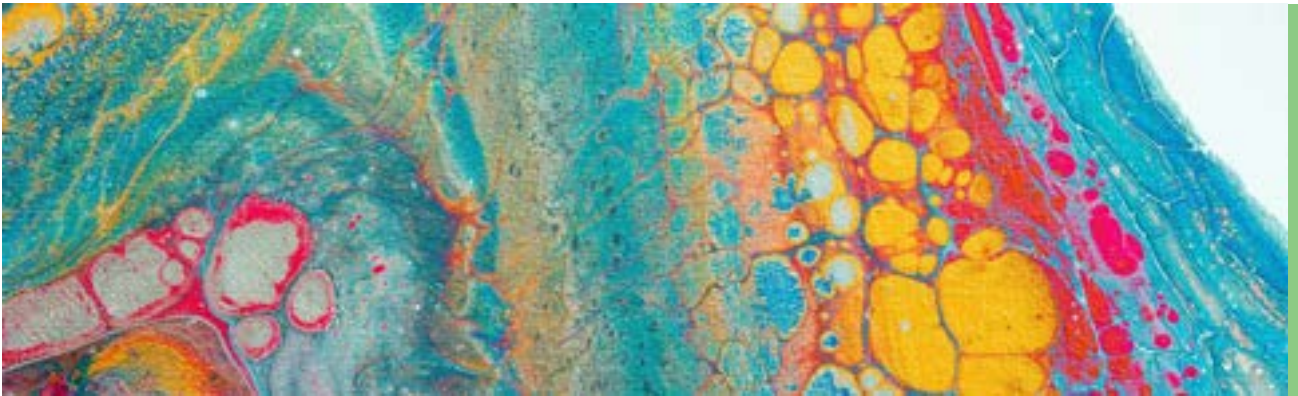
The impact of our work extends far beyond academic outputs, it reflects a vision of science that is transformative, inclusive, and deeply aligned with societal needs. In an era marked by profound demographic shifts, the wearable revolution, and a growing burden of chronic diseases, our contributions seek to redefine how nutrition is understood and practiced across healthcare, public policy, and individual lifestyles.

We envision a future where individuals have access to personalized, data-driven dietary recommendations grounded in scientific evidence, powered by artificial intelligence, and adapted to their unique biology and life context. Our research is paving the way toward that future by building predictive models, generating mechanistic insight, and validating interventions that are both scalable and effective.

Through our spin-offs and computational platforms, we aim to catalyze innovation in the food and health industries, while our citizen science and outreach programs democratize access to nutritional and health knowledge. Ultimately, we aspire to help create healthier, more resilient societies—where science empowers action, and nutrition becomes a cornerstone of well-being.

The Computational Biology Group at IMDEA Food aspires to redefine the role of nutrition in medicine. By integrating cutting-edge science with real-world application, and by fostering an ecosystem of innovation and collaboration, we are laying the foundation for a future where precision nutrition is accessible, effective, and sustainable for all.





RESEARCH PROGRAM

Precision Nutrition and Obesity

Goal and vision

The Precision Nutrition and Obesity program, led by Prof. José María Ordovás, aims to revolutionize obesity prevention and treatment through a personalized, science-driven approach. Recognizing that individuals respond differently to diet and exercise; the program seeks to understand the biological foundations of obesity susceptibility and intervention efficacy. By leveraging cutting-edge tools in genomics, epigenomics, metabolomics, and microbiomics, the program uncovers molecular signatures that explain these inter-individual differences. To address the significant burden of obesity-related diseases—such as diabetes, cardiovascular disease, and cancer—among aging populations, the program incorporates insights from longitudinal cohort studies and nutritional intervention trials to improve quality of life and support healthy aging. Pioneering the integration of novel technologies, the program actively adopts artificial intelligence and machine learning to analyze complex biological data and predict individual responses to nutritional strategies. These innovations enable the development of tailored interventions with unprecedented precision and scalability. Under Prof. Ordovás's leadership, this initiative stands at the forefront

of personalized health, aiming to translate scientific discovery into real-world strategies that redefine obesity management and set a new standard for preventive and therapeutic nutrition in the 21st century.

Nutritional Genomics and Epigenomics

Embedded within the Precision Nutrition and Obesity program, our research group is dedicated to advancing genomic tools and knowledge to enable personalized management of obesity and its comorbidities. We focus on identifying genetic variants that predispose individuals to obesity and defining how these variants interact with specific dietary patterns to influence this risk. Our work also explores how diet modulates the epigenome, shaping obesity-related gene expression.

We are at the forefront of studying individual variability in postprandial responses to meals, providing critical insight into metabolic health. Leveraging artificial intelligence and machine learning, we are pioneering data-driven approaches to decode personal responses to nutrition—advancing the frontiers of Precision Nutrition with actionable, individualized strategies.

- **Identify and functionally characterize genetic variants associated with obesity and its comorbidities.** To discover and validate genetic variants that contribute to individual susceptibility to obesity and related metabolic disorders, enabling the development of predictive genomic tools for early risk assessment and stratified intervention strategies.

- **Elucidate gene-diet interactions influencing obesity risk.** To define how specific dietary components interact with obesity-associated genetic variants, with the goal of uncovering mechanisms by which nutrition modulates genetic predisposition, thereby informing personalized dietary recommendations.
- **Investigate the role of diet in shaping the obesogenic epigenome and postprandial metabolic responses.** To understand how nutritional exposures influence epigenetic modifications linked to obesity and to characterize inter-individual variability in postprandial metabolic responses, using integrative omics, artificial intelligence, and machine learning to support the development of targeted precision nutrition interventions.

Cardiovascular Nutritional Epidemiology



We aim to produce relevant information to support clinical and population-based interventions aimed at improving dietary intake and physical activity and, subsequently, controlling cardiovascular disease and its functional adverse consequences

- To identify nutritional and omic determinants of frailty, malnutrition, multimorbidity and functional status in older adults.
- To elucidate the role of diet and physical activity as determinants of obesity and cardiovascular risk in older adults.

INFLUENCE OF DIET ON THE DEVELOPMENT OF CARDIOMETABOLIC DISEASES RESEARCH LINE

- Influence of ultra-processed food consumption on cardiovascular health, frailty, and cardiovascular health.
- Cooking methods and their association with inflammatory and cardio-metabolic biomarkers.
- Influence of phthalate and phosphate consumption on cardiovascular health and subclinical atherosclerosis.

NUTRITION AND OMIC DETERMINANTS OF FRAILITY, MULTIMORBIDITY AND UNHEALTHY AGING RESEARCH LINE

- The impact of lifestyles in the development of multimorbidity in older adults. A longitudinal approach.
- Identification of pathways of the aging process, and their dietary, social and metabolomics determinants. The AGE_path study.

RESEARCH LINE

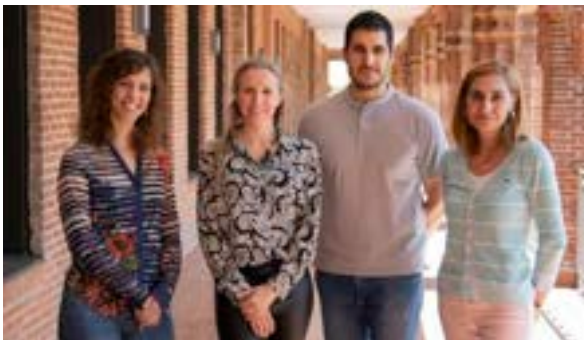
- The study of the association between different dietary patterns and healthy lifestyles adherence (including the Mediterranean lifestyle (MEDLIFE index)) and chronic diseases in large cohort populations (including cardiovascular disease, cardiometabolic risk factors, and healthy aging, frailty).
- The development of new Healthy Lifestyle Scores to study its association with main chronic diseases. (Grant PI20/00896).
- The development of interactive web and mobile applications based on the Healthy Lifestyle Scores for its implementation in the clinical practice and occupational settings. (Grant PI20/00896).
- The study of Mediterranean diets intervention in occupational health (Funding grants by the Federal Emergency Management Agency, USA)(Grant: EMW-2020-FP-00063; EMW-2014-FP00612X).
- Precision nutrition: Mediterranean diet metabolic signatures(Grant: PMP21/00093).

- Sustainable plant-based diets and lifestyles and chronic diseases in several cohorts (Nurses' Health Study, Health Professionals Follow-up, UK biobank, ENRICA).

PHYSICAL ACTIVITY AND SEDENTARY BEHAVIORS AS DETERMINANTS OF OBESITY AND CARDIOVASCULAR AND DEATH RISK IN THE GENERAL POPULATION RESEARCH LINE

- To describe physical activity patterns in population-based cohorts.
- To examine the association of physical activity with key health outcomes.
- To promote physical activity at population level across the lifespan.

Nutritional Control of the Epigenome



Our research group envisions contributing to the scientific understanding of **metabolic flexibility** as a critical physiological capability that supports energy homeostasis, prevents cardiometabolic diseases, and promotes healthy aging.

As aging progresses, metabolic flexibility becomes increasingly impaired, largely due to disruptions in epigenetic mechanisms regulating gene expression. The **cellular epigenome**, given its

dynamic and modifiable nature, plays a pivotal role in preserving metabolic function

Based on this framework, our research focuses on how **nutrition** and specific bioactive compounds can precisely modulate the epigenome. Our ultimate goal is to develop **precision nutritional strategies** and **functional food products** that target epigenetic mechanisms to sustain metabolic health and delay age-related decline.

- **Exploration of Epigenomic Modulation by Nutrition:** To comprehensively investigate how nutrients and dietary patterns exert their influence at the cellular epigenomic level. Our focus is on the precise characterization of alterations in DNA methylation marks and the expression levels of key microRNAs that regulate the central molecular pathways of aging. Through rigorous nutritional intervention trials, our group seeks to unravel the potential of foods and their bioactive components as modulators of the obesogenic epigenome, with the goal of applying this knowledge to the creation of precision foods for the prevention of cardiometabolic diseases and the promotion of healthy biological aging.
- **Unraveling the Liver-Heart Axis in Metabolic Disease:** To decipher the fundamental role of metabolic non-alcoholic fatty liver disease (MAFLD) and hepatic lipid metabolism in the genesis and progression of cardiovascular disease. In parallel, we are dedicated to the identification of nutrients with significant hepatoprotective potential, which can serve as the basis for the design of precision foods specifically aimed at the prevention and management of MAFLD and its cardiovascular comorbidities.
- **Integration of Artificial Intelligence for Precision Nutrition:** To investigate the transformative potential of analysis methods based on machine learning and artificial intelligence in the characterization of individual responses to diet. In our studies, we apply a comprehensive multi-omics approach and develop innovative machine learning algorithms to establish the foundations for the application of these advanced technologies in nutritional intervention trials and in the clinical practice of Precision Nutrition, opening the door to highly personalized and effective dietary strategies.



RESEARCH PROGRAM

Precision Nutrition and Cardiometabolic Health

Goal and vision

The Precision Nutrition and Cardiometabolic Health Program, directed by Prof. J. Alfredo Martínez, positions IMDEA Nutrition at the forefront of research in obesity and cardiometabolic diseases. This program integrates cutting-edge science with translational goals, bridging basic research and clinical practice. Through strategic leadership in national and international intervention projects it seeks to generate high-value cohorts and databases essential for understanding genetic, epigenetic, and metabolic factors underlying complex chronic diseases, as we have pursued with projects such as NUTRIMDEA, METAINFLAMACIÓN, DIETARY DEAL, Phenoldelivery and plastic4food.

Our approach is based on these four principles—participative, predictive, preventive, and personalized—aiming to design interventions that are not only scientifically sound, but also healthy, sustainable, safe,

and satisfactory for patients and consumers. Using advanced omics technologies, machine learning, and patient phenotyping, we are leaders in classifying individuals into actionable clusters and developing targeted, Mediterranean-style anti-inflammatory nutritional strategies.

The program is a national and international reference in nutritional biomarker discovery, dietary intake assessment via metabolomics, and anti-inflammatory interventions for conditions like obesity and metabolic syndrome. It also plays an active role in training young researchers and engaging with society, translating scientific knowledge into tools and guidelines that can shape public health policy. With this integrated and future-oriented vision, the program strengthens IMDEA Nutrition's leadership in precision nutrition, reinforcing its global impact and alignment with strategic health priorities.

This program highlights IMDEA Nutrition's commitment to global health impact, aligning scientific discovery with clinical application and policy innovation. Under Prof. Martínez's leadership—an internationally recognized expert with over 900 publications and more than 20,000 citations—the program seeks to foster interdisciplinary and international collaboration across three specialized and strategic groups: Cardiometabolic Nutrition, Bioactive Ingredients in Food, and Epigenetics of Lipid Metabolism.

Cardiometabolic Nutrition



The Cardiometabolic Nutrition and Precision Nutrition Program aims to transform the understanding, prevention, and management of cardiometabolic diseases through advanced nutritional science. Our approach integrates clinical phenotyping, omics (metabolomics, metagenomics, genomics, epigenomics) and machine learning to develop personalized nutritional strategies that optimize metabolic health and reduce the burden of diseases like obesity, type 2 diabetes, dyslipidemia, and cardiovascular disease.

We focus on translating complex biological and metabolic data into actionable nutritional solutions that improve health outcomes and reduce the burden of obesity, inflammatory diseases, cardiovascular disease, and related conditions. Our approach is systems-oriented, recognizing the interplay between diet, genetic background, lifestyle, gut microbiota and environmental factors in shaping metabolic health.

Our goal is to move towards an adaptive, sustainable nutrition model capable of preventing, reversing, or better managing complex diseases. Through strategic collaborations with academia, healthcare, the food industry, and policymakers, we are building a robust ecosystem for the future of nutrition, impacting clinical practice, public health policies, and everyday life.

- **Personalized nutritional interventions.** Design and implement evidence-based, personalized, predictive, preventive, and participative nutritional strategies aimed at improving metabolic health and reducing the risk or impact of chronic diseases such as obesity, dyslipidemia, and cardiovascular disease. This includes the use of

clinical phenotyping, multi-omics technologies (e.g., metabolomics), and machine learning to stratify individuals and tailor dietary interventions, especially those with an anti-inflammatory and Mediterranean profile.

- **Translational and scalable solutions.** Convert complex biological and phenotypic data into practical, scalable, and cost-effective tools for healthcare and daily life. This includes developing targeted dietary guidelines, personalized treatment approaches, digital health applications, and more efficient clinical trials. The group seeks to lead in dietary intake assessment using omics, and in the clinical translation of anti-inflammatory interventions for chronic diseases.
- **Public health and societal impact.** Foster collaboration with academia, healthcare systems, policymakers, and the food industry to position precision nutrition as a cornerstone of sustainable public health strategies. Promote nutrition that is social, healthy, safe, sustainable, and satisfactory, while actively contributing to public education and scientific dissemination. The group's mission includes influencing policy and improving care outcomes by integrating nutrition into the prevention and treatment of major chronic conditions.

Bioactive Ingredients Food



The group aims at developing research lines that build upon strong basic research foundations. The findings are usually validated in pre-clinical models and finally tested in human trials. In close collaboration

with private companies and also applying for research funds, the group maintains a strong publication record and entertains several collaborations worldwide. The core investigation activity of the group concerns (poly)phenols, namely those of olives for which the group is renown and that often attracts the interest of media and international bodies, such as the International Olive Council. In addition, the group enjoys a close collaboration with the CIAL/CSIC, with which develops investigation on milk fat globule membranes.

- Milk fat globule membranes and their role in slowing cognitive decline and in infant nutrition.
- Milk fat globule membranes and their role in the immune system ("immunefitness"). The group is developing a functional food composed of such membranes and carotenoids, with particular focus in the gastrointestinal tract, where immunity is largely regulated.
- Olive (poly)phenols and their actions on the cardiovascular system. In particular, the group is studying Non-Alcoholic Fatty Liver Disease (NAFLD), whose prevalence is rapidly increasing worldwide. Its modulation by olive phenols and the search for microRNAs to be employed diagnostically are now at the forefront of the group's research.



Epigenetics of Lipid Metabolism



- Understand how different **non-coding RNAs regulate lipid metabolism** during states of health and disease, developing new strategies, both pharmacological and dietetic, to modulate their function.
- Understand **lifestyle modification of the epigenome** trying to personalize the health of individuals using epigenetics (DNA Methylation and ncRNAs) for the development of Precision Nutrition.
- **Pharmacological or dietary modulation of the activity of non-coding RNAs** that, ultimately, regulate the metabolism of lipids lead to the prevention or treatment of cardiometabolic diseases.
- Understand the possible regulatory role of dietary miRNAs on **genome modulation via cross kingdom communication**.
- Use of extracellular vesicles as emerging vehicle for drug delivery and evaluate their potential application in the transport of other bioactive compounds.
- Understand the **role of endogenous and exogenous sORFs (micro-peptides) in the gut-liver axis** in the context of lipid metabolism and evaluate the impact of dietary components in their modulation.
- Decipher the potential risk derived from the involuntary ingestion of nanoplastics and their effects on the epigenome.



RESEARCH PROGRAM

Childhood Precision Nutrition

Goal and vision

Our overall goal is to understand the different causes of obesity during childhood and improve treatment options, as well as growth disorders and normal and pathological pubertal development in relationship to nutrition.

Childhood Obesity

- To study the molecular basis of childhood obesity and its comorbidities in order to promote precision therapies, including nutritional approaches and new treatments for monogenic obesity.
- To investigate the interaction between epigenetics, genetics, genomics and diet, both quantity and quality, and their influence on long-term health outcomes.
- To understand the effects of early nutrition and hormonal changes on longterm metabolic health and how the brain, especially glial cells, responds to specific nutrients that affect metabolism and neuroinflammation.
- To understand the interaction between nutrition and pubertal development as well as the underlying causes of early and precocious puberty.





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Nutritional studies
laboratory

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Genetic and genomic
analysis laboratory

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Laboratory for
analytical and
immunometabolic
techniques

56

Data analysis
laboratory

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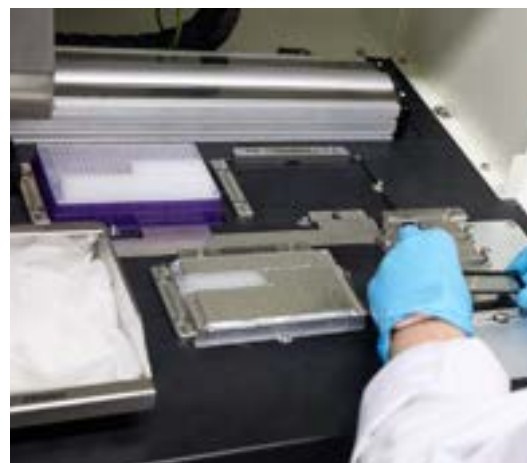
Nutritional studies

LABORATORY

This is a laboratory for interaction with people (“volunteers”) who come to the Centre to participate in Precision Nutrition studies. The experimental design consists of the application of a specific food or type of food to study its health, metabolic, immunological, genetic, etc. effects. The volunteers who participate in these analyses provide information by analogue or digital means, which is completed with anthropometric, genetic, microbiological, metabolic, etc. studies.

Main equipment:

- Horizon DXA system¹, which includes a set of high-resolution digital detectors as well as a high-frequency X-ray generator equivalent to CT scanners. It allows images to be captured in great detail, even in large or obese patients. All members of IMDEA Alimentación who are listed as operators are accredited to operate radiological equipment. Attached is documentation regarding its status as a radiological facility subject to external control.
- Echosens FibroScan elastograph², which uses ultrasound technology to measure liver stiffness. It is a fast, easy and reliable non-invasive scan that provides a quantitative value proportional to the degree of liver fibrosis.
- Ergospirometer with electrocardiogram³ for gas exchange analysis and resting electrocardiograms, together with a treadmill for these measurements during exercise. The system also monitors blood pressure. Together, this platform allows assessment of cardiopulmonary function at rest and during exercise.





Genetic and genomic analysis

LABORATORY

It is an advanced laboratory with the capacity to develop different categories of genetic analysis: hereditary genetic material (DNA genotyping), RNA gene expression (real-time and digital PCR) and genome regulation (epigenetics). The study of DNA from complex multi-organism samples (metagenomics) has been

incorporated as the first approach to *Next Generation Sequencing* (NGS) technologies that are expected to be implemented by 2024.

The typical experimental design of such studies consists of obtaining the appropriate genetic material for each experiment and using specific reagents to develop qualitative or quantitative assays on a series of genes under study or universal sets of genes to investigate the mechanisms responsible for different pathologies.

The activity of genetic analysis is recognised by the Community of Madrid with the U87 Certificate of Integrated Health Service in a non-health organisation.

Main equipment:

- Promega's Maxwell® RSC 48 Instrument⁴ nucleic acid extractor, capable of purifying different nucleic acids, such as genomic DNA, plasmid DNA, RNA or high quality total nucleic acids, from different types of samples. It allows starting from different biofluids (blood, saliva, plasma, urine) or matrices (cells, tissues, FFPE, swabs), environmental samples (faeces, soil, water) and microorganisms or viruses.
- QuantStudio™ 12K Flex Real-Time PCR System⁵, which allows absolute and relative quantification of nucleic acids, allelic discrimination of single nucleotide genetic variants (SNPs), detection of nucleic acid sequences of interest (*plus/minus* assays) and generation of dissociation curves.
- The equipment integrates a module for polymerase chain reaction (PCR), which allows to amplify and quantify in real time specific sequences of nucleic acids and to analyse a large number of samples. It incorporates specific programmes for assay configuration and data analysis. It can work with 384-well plate formats, 96-well plates, TaqMan® Array (TLDA) cards and OpenArray® chips.

- Applied Biosystems™ QuantStudio™ AbsoluteQ™ Digital PCR Kit⁶ is a system that enables target quantification with high precision and sensitivity. It is based on microfluidic array plates (MAP) that allow digital PCR reactions to be performed in nanolitre volumes (20,480 physically defined microinjection moulded microchambers). It incorporates integrated analysis software that coordinates sample partitioning, amplification and results. It allows copy number variation (CNV) analysis in DNA samples, detection of circulating tumour DNA in liquid biopsies, mutation analysis, gene expression analysis, absolute quantification of viral titres and in general any PCR-based determination.
- The Illumina iScan system⁷ is a scanner that enables fast, sensitive, and accurate imaging of Infinium BeadArray™ products. It enables the analysis of millions of single nucleotide reads through the use of lasers, optics and an advanced detection system. Enables *Genome-wide* Genotyping (*Genome-wide*), Copy Number Variation (CNVs) and Epigenetics (genome-wide Cytosine Methylation) studies.



LABORATORY

for analytical and immunometabolic techniques

In addition to the genetic analysis laboratory, GENYAL has been equipping itself with a battery of additional analytical tools, which complement and extend the Institute's core genetic studies. Some of the technologies are in the implementation phase and are expected to be completed in the coming months. The main analytical techniques developed and already implemented are as follows:

- Millipore's MAGPIX system together with Beckman's Access-2 autoanalyser⁸, which are versatile immunoassay platforms capable of qualitative and quantitative multiplex analysis (up to 50/100 tests in a single well). They have panel-based applications applicable for cancer, cardiovascular disease, immunology, metabolism or endocrinology, with the possibility to apply specific customised panels as well.
- Agilent's Seahorse XFe96 and Seahorse XF HS⁹ measure changes in cell metabolism in real time. They quantify the oxygen consumption rate (OCR) and extracellular acidification rate (ECAR) of living cells, allowing assessment of mitochondrial respiration and glycolysis, as well as ATP production. These measurements provide insight into cellular metabolic function and





can be used to assess metabolic changes resulting from different treatments or different physiological or pathological situations.

- The AU480 ISE chemistry autoanalyser¹⁰ is a basic clinical chemistry analyser used to determine and quantify a large number of blood and urine markers and metabolites. It can analyse more than 120 types of compounds and has a throughput of up to 800 photometric tests per hour. It is combined with the DxH520 autoanalyser¹¹ which is a haematological autoanalysis system.
- Thermo Fisher's TSQ Fortis Plus MS¹¹ mass spectrometry equipment is used for molecular identification, lipidomics and metabolomics studies. Its technology allows the identification of compounds in a wide range of mass-to-charge ratios (i.e., 5-3000 m/z), which enables the analysis of biomarkers of different nature (i.e., glyco/lipoproteins and lipids).
- BD FACSCelesta™ analyser from Becton Dickinson¹² is a flow cytometry device that can detect and analyse up to 14 parameters in a single sample. It allows to characterise phenotypically each cell by its surface markers, to know the intracellular state (cell metabolism, enzymes, mitochondrial function...), or to determine the stage of the cell cycle in which it is located.
- Organ-chip system(EMULATE)¹³ allows the creation of test systems that resemble the physical and physiological functions of a specific (human) organ in three dimensions, without the need to work with disaggregated cells. It allows, among many other applications, the cultivation of the microbiome with intestinal cells and host-microbiome interactions in a situation very close to in vivo conditions.

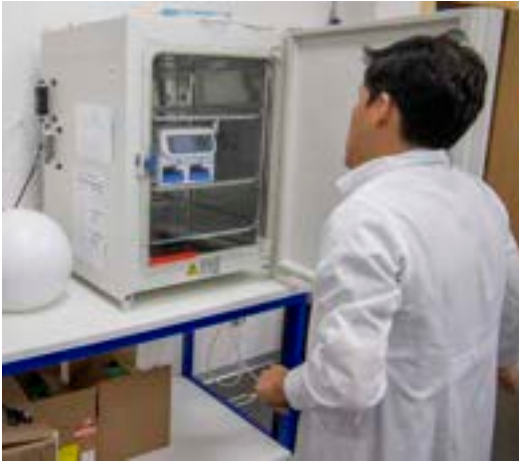
Data analysis

LABORATORY

IMDEA has as an essential part of its workflows the capacity to interpret the results obtained and the association between the experimental results and the clinical or nutritional parameters corresponding to each individual. The platform combines bioinformatics and biostatistics tools and is making use of a high-capacity computer server¹⁴ (> 50 TB of storage capacity, > 256 Gb of RAM memory) capable of handling the platform's current data and of dealing with the “big data” that are beginning to be generated in the laboratory due to the ongoing implementation of Massive Sequencing (NGS) technologies.

Summary of available techniques and main applications

EQUIPO	TÉCNICA	APLICACIONES
Sistema DXA Horizon	Análisis corporal	Estudios de intervención nutricional
Elastógrafo FibroScan	Fibrosis hepática	Estudios de intervención nutricional
Ergoespirómetro y electrocardiograma	Actividad respiratoria y ritmo cardíaco	Estudios de actividad metabólica
Extractor de ácidos nucleicos	Purificación de ácidos nucleicos	Estudios genéticos (todos)
Equipo de PCR a tiempo real	Amplificación por PCR	Estudios genéticos cuantitativos
Equipo de PCR digital	Amplificación por PCR de reparto	Cuantificación absoluta de ácidos nucleicos
Sistema iScan	Hibridación de sondas	Estudios de epigenética y genotipado de genoma completo
Autoanalizador Access-2 y sistema MAGPIX	Inmunoensayos	Cuantificación de moléculas basada en anticuerpos
Seahorse XFe 96 / HS	Actividad respiratoria celular	Estudios de consumo de O2 y metabolismo celular
Autoanalizadores químicos	Cuantificación de metabolitos	Análisis bioquímicos personalizados
Equipo de Espectrometría de Masas	Separación cromatográfica de biomoléculas	Análisis de peptidómica, lipidómica y metabolómica
Citómetro de flujo	recaje, identificación y separación de células individu	Estudios basados en marcadores de superficie celular
Sistema de organ-on-a-chip	Cultivos e interacciones celulares en 3D	Simulación de las condiciones celulares in vivo
Servidores bioinformáticos	Procesamientos informáticos de alta capacidad	Análisis bioinformáticos y bioestadísticos







ser

Services

Platform of Clinical
Trials: GENYAL

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Clinical trials
carried out

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Platform of Clinical Trials: GENYAL

The Platform for Clinical Trials GENYAL constitutes a high-level scientific tool to assess the biological activity and health properties of food, supplements, targeted nutritional strategies and functional foods, taking into account the specific characteristics of population subgroups. Thus, GENYAL is a specialized platform for clinical trials in Precision Nutrition.

Both observational and clinical intervention studies involving healthy subjects and those with pathologies can be performed (obesity, diabetes, dyslipidemias, celiac disease, etc.), both in adults and childhood. We investigate how individual characteristics (genetics, microbiome, physiology, etc.) interact with nutrients and food components, in order to provide specific recommendations and products to promote health.

GENYAL caters Spanish and foreign research groups and companies working on nutritional genomics and targeted nutrition, interested in:

- Nutritional intervention studies required for product development or for obtaining official approval of the nutritional and health claims made for products.
- The generation of the information needed to provide added value to new and existing products (e.g., the identification of new indications and the most appropriate target groups of population). Main activities include postprandial response to different functional food and bioavailability components studies in humans, or the determination
- of the effectiveness of nutritional products in health promotion taking into account specific characteristics that might condition efficacy.
- The identification of (mainly) genetic or metabolic markers involved in the response to product consumption.
- Analysis of the interaction among genotype-microbiota and food components.
- Targeted nutrition for specific populations, including both, health (childhood, post-menopausal period, sport performance, etc.) and disease (obesity, metabolic syndrome, dyslipidemias, etc.).



UNIT

Nutrition and Clinical Trials

The Nutritional and Clinical Trials Unit undertakes nutritional intervention studies designed to assess the biological activity and health properties of functional foods/bioactive compounds and diets in humans. Both observational and clinical intervention studies involving healthy subjects and those with pathologies can be performed.

The Unit has an intervention/extraction room, two nutritional consultation offices, a room for short-term monitoring, and a room for discussions and conferences on nutritional education. An independent ethics committee ensures that the rights, safety and wellbeing of trial participants are upheld, by taking into account the methodology of proposed trials, their ethical and legal aspects, and the balance between risks and benefits. This committee is formed by professionals of recognized prestige and experience in research.

The Nutrition and Clinical Trials Unit is registered in the Community of Madrid with number CS13175 (13/05/2015).

UNIT

Nutritional Genomics and Health

The nutritional genomics and health unit aims to give a precision approach to classic nutritional strategies, based on the effect that genetics has on each person. The objective consists in evaluating and improving precision nutritional strategies to achieve greater adherence and effects of dietary treatments.

Precision nutrition strategies for patients with chronic diseases.

Application of nutrigenetic interventions in patients with chronic diseases including obesity, metabolic syndrome and cancer, in order to improve their nutritional and health status. This is carried out through the design and analysis of specific genotyping panels, as is the case of a nutrigenetic panel for oncological patients that has been developed within ALIBIRD2020 project, which association to clinical outcome, microbiome status, and the presence of molecular and biochemical biomarkers is determined. Personalization of nutritional recommendations according to their clinical conditions, phenotypic and genotypic results is performed, and applied in different clinical trials in collaboration with the endocrinological and oncological medical services of different hospitals.



Personalized nutritional advice for health promotion throughout the different stages of life.

Design and clinical validation of genotyping panels with genetic variants related to obesity, energy balance, carbohydrate and lipid metabolism, metabolic response to exercise, food intolerances, biorhythm, etc., in order to generate personalized nutritional recommendations to improve health throughout life. Specific physiological conditions, objectives and life stages are considered.

PROJECTS IN FOCUS

FNS-Cloud Food Nutrition Security Cloud: Cloud solution facilitates access to food and nutrition information

Principal Investigator: Dr. Enrique Carrillo de Santa Pau

Funded by: Horizon 2020

Call: H2020-EU.3.2.2.3 Ref: GA No. 863059.

Web: <https://www.fns-cloud.eu/>

The main aim of the EU-funded FNS-Cloud project is to overcome fragmentation by federating FNS data on diet, health, and consumer behaviour as well as sustainable agriculture and the bio-economy. The implemented cloud solution will increase the exploitation of FNS knowledge and will contribute to reducing knowledge gaps that inhibit public health and agricultural policy. Furthermore, it will support the food industry in reducing development and production costs and increasing sustainable production. Ultimately, the cloud solution will facilitate informed and healthy choices by consumers.

UNIT

Biostatistics and Bioinformatics



The many external molecules we ingest (food, environmental compounds, pharmaceuticals) and the metabolites resulting from them through host and microbial transformation in the gut, establish molecular interactions with human and microbial proteins through which multiple biological processes are regulated. Different diseases (e.g. inflammatory bowel disease, colon cancer, cardiovascular diseases, neurodegenerative diseases, etc.) result from the dysregulation of one or more of these interactions. Research on this complex system of molecular interactions, through the identification of key small molecule-protein interactions, and their characterization at the atomic level, can provide causal explanations for the diseases, and on the other hand can be used to generate new therapeutic small molecules to cure the disease by modulating the dysregulated interactions.

We pioneer the application of a combination of Cheminformatics and Artificial Intelligence, of current success in the pharmaceutical industry, to the design of new drugs targeted to the gut microbiome-host system above described. Given the peculiarities of this system, that combines both large numbers of small molecules and proteins, we develop new methods coupling physics-based simulation and AI to analyze and predict the structural chemobiological space of these bioactive molecules. In addition, we create new generative AI models to the design of inhibitors constrained to the particular features of this system. Through alliances with academic or industrial partners we test

these molecules in experimental models to identify new candidates for drug discovery.

- Full characterization of the chemo-biological space of human microbial metabolites, food compounds, and other xenobiotics, through computational approaches: what molecule interacts with what host or microbial protein target, using both physics- and AI-based approaches, and through the development of new methods combining both approaches for this system.
- Full characterization and modeling of the physicochemical and bio-distribution properties of these bioactive molecules, in order to be able to predict these properties from molecular structure for new candidate compounds.
- Develop new generative AI methods to design molecules capable of inhibiting microbial or host proteins conditioned on their binding sites and optionally on known metabolite of food templates.

PROJECTS IN FOCUS

Linking Intestinal Bacteria and Host Metabolism to Tackle Type 2 Diabetes with Novel Food

Principal Investigator: Dra. María Isabel Espinosa Salinas

Funded by: European Commission

Duration: 2024-2028

Call: HORIZON-EIC-2023-PATHFINDERCHALLENGE 01-03 – 101162517

Web: <https://eic-pathfinder-diban.eu/>

DiBaN binds together the necessary combination of expertise to address this question, based on the concept that the initial driver of the nutritional effects is the metabolic shift that takes place in the intestinal bacteria which is transduced to the host. In this context, technological breakthrough tools for novel food development, that ensure the promotion of a healthy microbiome-host metabolic interface, are an urgent need to prevent dysbiosis and T2D. DiBaN will overcome current limitations in nutrient-testing by developing advanced ex-vivo platforms that fully recapitulate the in vivo setting of

dysbiosis and insulin resistance, that will be validated with in vivo omic data. To warrant the health promoting effects of novel foods we will test a new concept in the emerging field of insect food technology, that an adequate insect's metabolic-intestinal health ensures the healthy properties of its derived products. The validation of this idea will also serve to identify biomarkers for the monitorization of the insect's health status.

AI-METMI: Artificial Intelligence boosted computational platform for the development of human microbial METabolite-Mimics as drugs and nutraceuticals.

Principal Investigator: Dr. Gonzalo Colmenarejo (IMDEA Food)

Funded by: Spanish Ministry of Science and Innovation.

Duration: 01/09/2022-31/08/2026

Call: PID 2021. Ref: PID2021-1273180B-I00

This Project aims at using a combination of three computational methodologies, namely cheminformatics, bioinformatics, and artificial intelligence, to set up a platform useful for speeding up the design of drugs and nutraceuticals mimicking microbiome metabolites. The platform will assist in characterizing the physicochemical properties, structures, and biodistribution of metabolites, as well as identifying protein-metabolite interactions of relevance to diseases. Generative artificial intelligence models will be developed for the in silico design of metabolite-mimicking molecules with curative (drugs) or preventive (nutraceuticals) functionality.

Artificial Intelligence-boosted computational platform for the development of human microbial METabolite-Mimics as drugs and nutraceuticals (AIMETMI)

Principal Investigator: Dr. Gonzalo Colmenarejo (IMDEA Food)

Funded by: MCIN/AEI/10.13039/501100011033 AND BY "ERDF A WAY OF MAKING EUROPE"

Call: PID2021-1273180B-I00 (2022-2026) Programa de Generación de Conocimiento 2021



GENYAL Lab



The Genomics Laboratory has the necessary infrastructure for providing genetic and genomic services, as well as metabolomic analysis, providing technical and scientific support to researchers and private companies.

This Laboratory is equipped with appropriate devices for sample processing and nucleic acid extraction and quantification, as well as the latest hardware for gene expression and high performance

genotyping analysis, such as the latest generation QuantStudio™ 12K Flex System apparatus. Other equipments for genomic analysis include qPCR 7900HT and conventional PCRs.

These devices have different applications, such as digital PCR, DNA fragment analysis, expression/gene quantification analysis, allele discrimination using TaqMan probes, and the detection of SNPs and mutations, etc.

In addition, the laboratory has specific equipment for analyzing metabolites with different techniques such as chromatography (Agilent 1260 HPLC system), cellular metabolism measurement (Seahorse XFe96), or simultaneous detection and quantitation of several secreted proteins (Luminex MAGPIX® System). These techniques provide a high value added tool in nutrigenomic and nutrigenetic studies, to achieve effective Precision Nutrition.

The Genomic Laboratory GENYALab has the accreditation as Genetics Unit U.78 and is member of REDLAB, the laboratories network of the Community of Madrid, under the **registration number 440**.

GENYAL LAB participates in **ALIBIRD2020-CM project (S2018/BAA-4343)**: "Therapeutic formulas of precision nutrition for cancer" supported by program call of R&D Activities among Research Groups of the Community of Madrid (Technologies 2018) and co-financed with European Union Structural Funds.





Clinical trials carried out

Characterisation of brain-gut profiles and relationships using resting electroencephalographic (EEG) activity and gut microbiota (BRAINT)

Reference: IMD PI-072

Funded Project: PID2022-141717NB-C22.

The main purpose of BRAINT project is to generate knowledge in a field that relates neurological and mental health to gastrointestinal, with the potential to study the applicability of precision nutrition in this field. Gut microbiota diversity and enterotypes will be associated to the properties of brain networks and cognition. The hypothesis underlying this project is that the composition of the gut microbiota is related to individual variability in the properties of brain networks that, in turn, mediate cognitive response. In this context, precision nutrition is presented as a potentially effective strategy for the modulation of both the microbiota and cognitive function.

Nutritional intervention study to stratify (metabotipated) fertile vs menopause women and evaluate the effectiveness of a polyphenol-rich food supplement on microbiotics, climate symptoms, quality of life and cardiovascular risk in menopause women (PolyPAUSE)

Reference: IMD PI-065

Funded Project: CEBAS-CSIC (PID2022-1364190B-I00. MICINN-Proyectos de Generación de Conocimiento 2022)

The main objective is to understand the possible change in polyphenol metabolism by the gut microbiota in the transition to menopause and its impact on health.

Descriptive study of molecular markers of immunosenescence with nutritional intervention to evaluate the implementation of digital tools in the capture of nutritional data

Reference: IMD PI052

Funded Project: Y2020/BI06350. Comunidad de Madrid

Given the ageing population, the high prevalence of chronic diseases such as obesity and exposure to various risk factors, as well as the need for further progress in the area of nutrition, and given the advances in technology in recent years, we intend to conduct a descriptive study of molecular markers of immunosenescence in different population groups along with the study of nutritional intervention in overweight and obese patients in order to identify these differential patterns and

implement a new generation of digital tools for data capture and help in making personalised decisions in the nutritional field. These tools will allow a more objective and effective assessment of the nutritional status of individuals.



Analysis of the applicability of an e-health platform and its impact on the follow-up of cancer patients: a pilot study in a sample of patients with advanced non-small cell lung carcinoma.

ALIBIRD® mHealth

Web Link: <https://alibird.org/2020-CM/>

Funded Project: ALIBIRD2020-CM (S2018/BAA-4343)

Population Addressed: Lung cancer patients

The aim of the ALIBIRD® mHealth platform is to facilitate clinical decision-making during cancer treatment with a two-fold objective: to empower and motivate patients to follow personalised recommendations and prescribed strategies for their treatment, and to support the remote follow-up of patients by medical professionals through the telemedicine system.



Descriptive study of molecular markers of immunosenescence with nutritional intervention to evaluate the implementation of digital tools in the capture of nutritional data.

AI4FOOD

Web Link: <https://www.ai4food.org/>

Clinical Trials Reference: NCT05807243

Funded Project: "Y2020/TCS-6654 AI4Food-CM. Artificial Intelligence for the Prevention of Chronic Diseases through Personalised Nutrition" (funding of the nutritional intervention protocol followed with specific sensors for the application of AI).
Population Addressed: Overweight and obese men and women

The main goal of AI4Food is to integrate all the aforementioned information and develop new machine learning algorithms to generate a paradigm shift in the field of nutritional counseling. Preliminary results are promising as both data collection methodologies have been successfully compared and all information on the variables obtained has been integrated. It will allow improving and personalising the lifestyle recommendations given to the population.



Effect of an energy-restricted mediterranean diet, physical activity and behavioral treatment on the primary prevention of cardiovascular disease

Co-Or: Jordi Salas Salvadó (Universitat Rovira I Virgili)

IP: Lidia Daimiel

Period: October 2015 to December 2024

Participating entities: C.S. Aquitania; C.S. Buenos Aires; C.S. Bustarviejo; C.S. Ibiza; C.S. Fuencarral; C.S. Colmenar Viejo; Hospital de La Paz

Web Link: <https://www.predimedplus.com/>

Clinical Trials Reference: ISRCTN89898870

Funded Project: This work was supported by a project grant from the Fundación Francisco Soria Melguizo. The project also received support from the Community of Madrid and the European Union, through the European Regional Development Fund (ERDF)-REACT-EU resources of the Madrid Operational Program 2014-2020, in the action line of R + D + i projects in response to COVID-19, FACINGLCOVID-CM. The PREDIMED-Plus trial was supported by the official Spanish Institutions for funding scientific biomedical research, CIBER Fisiopatología de la Obesidad y Nutrición (CIBEROBN) and Instituto de Salud Carlos III (ISCIII), through the Fondo de Investigación para la Salud (FIS), which is co-funded by the European Regional Development Fund.

Population Addressed: Men and women; 55-70 years old; BMI: 27-40 Kg/m²; With metabolic syndrome

The main objective of PREDIMED-PLUS is to evaluate, in comparison with a control group given non-intensive, energy-unrestricted dietary advice (also Mediterranean type), the effect of an intensive lifestyle intervention comprising an energy-restricted Mediterranean diet, increased physical activity and behavioral support on:

1. The incidence of cardiovascular events (non-fatal myocardial infarction, non-fatal stroke, or cardiovascular death).
2. Weight loss and long-term maintenance of weight-loss.



ENDONAFD: Relationship between non-alcoholic fatty liver disease and endothelial damage in patients at high cardiovascular disease risk.

IP: Lidia Daimiel Ruiz

Co-IP: Diego Martínez Urbistondo

Period: January 2024 to December 2024

Participating entities: Hospital Clínica Universidad de Navarra; Hospital HM Montepríncipe; Hospital 12 de Octubre; Hospital Central de la Defensa Gómez Ulla

Funded Project: Sociedad Española de Arteriosclerosis

Population Addressed: Men and women; 50-69 years old; Cardiovascular disease risk with or without NAFLD

The main objective is to describe the relationship between endothelial damage and non-alcoholic fatty liver disease using biomarkers clinically available in a population at high risk of cardiovascular disease.

Estudio piloto aleatorizado, doble ciego, controlado con placebo, para la evaluación de un suplemento nutricional potenciador del sistema inmune (rosmalip) en la prevención de infecciones durante la pandemia de covid-19 en pacientes oncológicos que reciben tratamiento antitumoral (oncovinf)

Imdea Alimentación/ Hospital Universitario Infanta Sofía /FORCHRONIC

Web Link: <https://alibird.org/2020-CM/formulas-terapeuticas-de-nutricion-de-precision-para-el-cancer/>

Clinical Trials Reference: NCT05080920

Funded Project: Convocatoria de Programas de I+D en Tecnología 2018 de la Comunidad de Madrid y cofinanciado con Fondos Estructurales de la Unión Europea. ALIBIRD2020 _S2018/BAA-4343

Population Addressed: Patients of both sexes aged between 18 and 85 years, with a diagnosis of solid tumor in active antitumor treatment (including chemotherapy, antitarget treatments, immunotherapy, hormone therapy), either for disseminated disease or perioperatively for localized disease. No history of having had COVID-19

The main objective of the study was to analyze the effectiveness of a nutritional supplement that enhances the immune system (Lipchronic) against infections, including COVID19, compared to placebo in cancer patients receiving antitumor treatment. The secondary objectives were exploratory and included evaluating possible effects of Lipchronic on the patients' quality of life, symptoms (especially focused on those symptoms associated with COVID19), nutritional status, clinical and analytical tolerance, antitumor, immune and anti-inflammatory effects.

The ONCOVINIF study closed early as the number of infectious events expected was not reached, being negative in its main objective of demonstrating a decrease in the number of infections - including COVID19. This fact is explained since the trial was designed at the beginning of the pandemic and, due to the strong isolation and hygiene measures, the number of infections. However, interesting effects of the experimental treatment are observed Lipchronic when compared to the group of patients administered a placebo in the exploratory secondary objectives of the study. More specifically, our results identified an activation of the immune system associated to the experimental treatment Lipchronic compared to the control, with peculiarities among the different groups of patients. Importantly, the RECIST score was improved in the Lipchronic group of patients, suggesting a better clinical response. Moreover, metastatic lung cancer patients improved the quality of life score (SF-36), which seemed to be associated to a better nutritional status and a reduction of inflammatory biomarkers (decrease in the positive acute phase reactants ferritin and C-reactive protein, as well as the inflammatory index Neutrophils/ Lymphocytes ratio, and an increase in transferrin negative reactant). These results encourage further research to apply precision nutrition as a complementary tool in the clinical management of cancer patients.



Healthy aging through time- restricted eating in adults with overweight/obesity and incipient liver disease: the ENSATI study.

IP: Lidia Daimiel

Co-IP: José M^a Ordoñas

Period: June 2023 to December 2024

Participating entities: Clínica Universidad de Navarra; C.S. Fuencarral; C.S. Núñez Morgado; C.S. Colmenar Viejo Sur

Web Link: <https://ensati.wixsite.com/ensati>

Clinical Trials Reference: NCT05880095

Funded Project: Proyecto PID2021-1258990B-I00 financiado por MCIN/AEI /10.13039/501100011033/ y por FEDER Una manera de hacer Europa

Population Addressed: Men and women; 55-70 years old; BMI 27-25 Kg/m² With fatty liver disease; With a time window greater than 14 h

The main aim is to investigate the effects of a time-restricted eating protocol, without caloric restriction on hallmarks of the healthy aging, including the metabolism, body composition, circadian rhythm, sleep quality, life quality, cognitive function and molecular hallmarks of aging.



Increasing multicomponent physical activity in older adults with a exercise-based toolkit and specialized virtual support: activeKIT Randomized Controlled Trial

Funded Project: AES 2020

Population Addressed: Older adults aged 65 years and older

The general objective of this project is to test whether the activeKIT intervention is effective in helping inactive older people to increase multicomponent physical activity at 3-months (short-term) and at 12 months (long-term). The activeKIT intervention is a 3-month complex intervention that includes a low-cost and easy-to-use exercise-based toolkit delivered at home with or without support by exercise specialists using virtual settings (e.g. video and audio calls, messaging apps, social

networks). A total of 450 participants randomly selected, aged 65+ years, will participate in this parallel three-arm randomized controlled trial (1:1:1 allocation). Primary outcomes include: aerobic physical activity by time spent in wrist worn moderate-to-vigorous physical activity and a field-based aerobic fitness test; muscle-strengthening by self-reported days/week and upper and lower body muscle strength tests; and balance training by self-reported days/week and the Timed Up & Go and the Four Square Step balance tests. Effect modifiers include: age, gender, sociodemographic variables, health status and intensity of the additional support/consultations to the exercise specialist. Other health outcomes are: fatness, blood pressure, self-efficacy, depression, chronic pain, health-related quality of life, sleep quality) at 3- and 12-month and. The same outcomes measured at baseline, with potential changes during the intervention, will be assessed after the 3 and 12 months. In addition, the activity monitor will be worn during at the 3-month intervention. The activeKIT intervention aims to be a generalizable cost-effective intervention, with potential to be implemented in the SNS, to increase physical activity and promote healthy aging in the older adult population.

Influence of LIFEstyle Behaviors and Cellular Hallmarks of AGING on age-related health problems associated with dementia and fragility (InLIFE-AGING).

IP: David Jiménez Pavón / Ana Carbonell Ona (Universidad de Cádiz)

Co-IP: Lidia Daimiel Ruiz

Period: November 2022 to December 2023

Participating entities: C.S. Dr. Trueta; C.S. Dr. Cirajas; C.S. San Andrés; C.S. Fuencarral; C.S. Ensanche de Vallecas; C.S. Valdebernardo; C.S. Galapagar

Funded Project: Junta de Andalucía

Population Addressed: Men and women; 50-79 years old

To investigate the relationship between the lifestyle and the molecular hallmarks of aging and their impact on physical and cognitive decline

Nutrición de precisión para el mantenimiento y mejora de la función cognitiva natac/p4h/imdea alimentación

Web Link: <https://nutrisionprecision.com/>

Funded Project: MINISTERIO DE CIENCIA E INNOVACIÓN _ RETOS DE COLABORACIÓN 2019 (HEALTH4BRAIN_RTC2019-007294-1)

Population Addressed: • Men and women > 55 years old. Two visits: initial visit and intervention visit (3 bioactive compounds in 3 subgroups).

The general objective of the project is to contribute to the personalization of the diet to improve the health and quality of life of the population, helping to maintain their cognitive function, through the design of personalized functional foods and through the design of a validated nutrigenetic test, which allows us to offer personalized recommendations based on the genetic profile of each individual.

Initially, an in vitro nutrigenomic study was carried out to determine the mechanism of action of the different NATAC products, and their effectiveness according to the targets identified for the different genetic profiles of the population previously identified by P4H. This nutrigenomic study provided molecular knowledge about the components that contribute to the prevention of cognitive deterioration, by altering the expression and/or functionality of different genes and signaling pathways, depending on the individual genetic constitution.

Once the most suitable compounds for each genetic profile were selected by the in vitro tests, a clinical validation trial was carried out in humans, in which to validate the usefulness of the P4H genetic test to identify the different needs of the different population groups according to their genetic profile, as well as the effectiveness of NATAC products to modulate the most relevant genes in each case determining the cognitive capacity.

NutriSi-ON: Precision nutritional strategies to reactivate the immune system impaired as a consequence of age, obesity or chemotherapy (Y2020/BIO-6350).

LABORATORIO DE NUTRICIÓN DE PRECISIÓN. IMDEA Alimentación.

IP: Dra. Ana Ramírez de Molina/ Dra. Cristina María Fernández

LABORATORIO DE INMUNOMETABOLISMO E INFLAMACIÓN. CMSO.

IP: Dra. María Mittelbrunn/ Dra. Elisa Carrasco

Web Link: <https://nutrisionprecision.com/>

Funded Project: PROYECTO FINANCIADO POR LA CONVOCATORIA DE PROYECTOS SINÉRGICOS DE I+D EN NUEVAS Y EMERGENTES ÁREAS CIENTÍFICAS (2020). NutriSION-CM Ref: Y2020/BIO6350

Population Addressed:

General objective: Analysis of immunosenescence marks in 3 target populations.

Populations:

- Young people between 18 and 25 years old without illnesses.
- People with obesity/overweight, over 18 years of age, who do not suffer from serious illnesses. Two visits: initial visit and intervention visit (low-calorie diet in the entire group).
- Men and women > 55 years old. Two visits: initial visit and intervention visit (3 bioactive compounds in 3 subgroups).

Age related deterioration of the immune system is responsible for a high susceptibility to autoimmune diseases, infections and cancer, as well as a decrease in vaccination efficacy. In addition to age, there are various environmental factors that accelerate the decline of the immune system and compromise its function. Exposure to chemotherapy, chronic infections, or obesity play a predominant role among these factors. Thus, elderly and obese individuals, and cancer patients, become highly vulnerable to the development of infection diseases, which has been evident in COVID-19 pandemic. With NutriSi-ON, we propose to design Precision Nutritional strategies to slow down the decline of the immune system as a consequence of age, obesity or



chemotherapeutic treatments. We propose a translational project between Molecular Immunology and Personalized Nutrition, with the broad objective of developing nutritional strategies with geroprotective and immunomodulatory activity that can boost the immune system in vulnerable population groups.

Nutritional intervention study to evaluate the efficacy of a food supplement on physical and psychological variables in women with menopause.

Funded Project: Universidad de la Laguna (España).

Population Addressed: Perimenopausal women

To determine the effect of the daily consumption of a combination of different compounds on the evolution of physical and psychological disorders that can appear during the menopause, in women



Sampling and analysis pertaining to the clinical trial entitled "HEALTHY EATING ON THE UAM CAMPUS. UAM COHORT"

Web Link: <https://ods.uam.es/cohorte-uam/>

Funded Project: Universidad Autónoma de Madrid

Population Addressed: General population (university students)

Collaboration for the performance of anthropometric assessment, sample collection and biochemical analysis of the population recruited in the cohort in 2023.

Study of the replacement of critical ingredients in biscuits on immunocompetence in a healthy population for the prevention of the risk and development of obesity/metabolic syndrome.

FOOD4INMUT

Funded Project: 0215-Food4ImNut_MCIU-PDI2019-10765RB-C22_ML

(state programme for knowledge generation)

Population Addressed: General population

To investigate the effect of replacing critical ingredients in biscuit formulation on immunocompetence to prevent the risk and development of obesity/metabolic syndrome'.

Study to evaluate the efficacy of the consumption of probiotic-enriched cereal products on the modification of the oral microbiome and nutritional status in school-aged children.

PROBIOMIC

Funded Project: Empresa Vida (Vértice de Innovación y Desarrollo de Alimentos, S.A.U.)

Population Addressed: Primary school children

Randomised, parallel, double-blind study to evaluate the effect of consumption of probiotic-enriched cereal products on modification of the oral microbiome.







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Innovation & society

Technology transfer
& Entrepreneurship

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& Education

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Citizen
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Technology transfer & Entrepreneurship



Gut-Finder®

Science-Based solutions to promote Healthy Aging

By 2050, the population over 80 years of age is expected to triple. The steady increase in longevity is a challenge that encompasses economic, social, structural, political, medical and scientific factors. **Whether we want or not, we all age.**

Development of an **AI-based technology** that integrates information from micro-organisms from faeces with metabolites from blood. This information is transformed into In silico, modelling that allows to predict changes in your microbiota by modifying some of single components. The specific treatments are selected to modulate your microbiota in a personalised way, which is considered the **new era of therapies for Precision Medicine**.

What we know your microbiota:

- Changes with diet, lifestyle, and aging.
- Changes with aging, and can be used to identify biological age.
- Influences our mood, make as exercise, and modulates our metabolism or immunology.

B2C SERVICE - SOLUTIONS

- Sequence your microbiome.
- Identify your Biological Age.
- Rejuvenate your microbiome.
- Restore your age & holistic health.



SPIN OFFS



Precision for Health P4H

Nutritional genomics for personalized nutritional strategies

www.p4h.es

P4H is constituted for the use and exploitation, industrial and commercial, of the innovations derived from the results obtained by IMDEA Alimentación and the UAM in the field of Precision Nutrition, that is, in the **design and application of effective nutritional strategies** in the improvement of health, adapted to the genetic profile of individuals and their lifestyle or physiological situation.

- Genetic testing and personalized nutritional counseling.
- Personalized precision nutritional counseling reports based on the analysis of genetic profiles and lifestyle conditions in areas such as sports or aging.
- Food products for Precision Nutrition.



Forchronic (4Chronic)

www.forchronic.com

Patent WO/2017/187000

It offers innovative solutions based on the development of a **new generation of precision and highly bioavailable nutraceuticals**, with a patented technology of lipidic vehiculization (TVL). It allows improving the bioavailability of natural extracts, with **therapeutic activity in chronic diseases** such as cancer and various autoimmune pathologies.

- Products for the relief, treatment and prevention of highly prevalent diseases. Capabilities validated scientifically and in clinical trials in patients.



PATENTS

Rosemary-extract compositions for treating cancer

Pub No.: ES2408730 B1
Application No.: P201131733

- Use of a **rosemary extract** in the preparation of a composition for **treating cancer**, in which there is a change in oestrogen signalling or lipid metabolism, to a composition comprising rosemary extract and a chemotherapeutic agent, and also to an in-vitro method for predicting the clinical response to an anti-tumour therapy using said composition.
- The present invention provides a new use of a rosemary extract in the treatment of certain cancers, specifically those in which there is an alteration in **lipid metabolism** or in the **oestrogen signalling pathway**.
- Furthermore, this composition can be combined with a conventional anti-tumour agent to obtain a synergistic effect.
- Products for the prevention and relief of diseases with beneficial results for people's health, which have been scientifically and clinically endorsed. Our company has developed and patented its TVL Technology (Technology of Lipid Vehiculization) that allows improving the bioavailability, solubility and accessibility of the natural extracts incorporated in nutraceuticals.
- Efficient release of the compounds in the organism and optimal absorption of the same, thanks to the incorporation of TVL technology.

A biotechnology company promoted by Canaan Research & Investment, the Autonomous University of Madrid (UAM) and researchers from the IMDEA Food Institute and the Infanta Sofia University Hospital, whose **technological innovation** lies in its **lipid vehicles**, which increase the bioavailability and biological function of bioactive phytochemicals.

Procedure for obtaining exosomes from buttermilk, exosomes obtained and their applications

Application No.: P202330029

- Procedure for isolating exosomes from buttermilk, as a **byproduct of the dairy industry** for large scale production.
- Describes the applications of exosomes obtained by the process in **medicine, cosmetics and nutraceuticals**.
- Highly purified exosomes from buttermilk can be used as nano-carriers of **extracellular RNAs or food bioactive compounds** for therapeutic usage.

Translational Venomics

Octo-PROTech

Venom-derived proteins from a marine source for use as a senolytic and senomorphic agent

Application No.: EP23382726.0

Small proteins with **therapeutic potential in aging** and aging-related diseases, including cancer and fibrosis. These proteins target senescent aka "zombie" cells that accumulate in the body and contribute to organ dysfunction.

Therefore, proteins are geared towards **rejuvenation physiological functions**. It could also help diminish inflammation and thus have potential application in chronic diseases.

- Biocosmetic special ingredient.
- Peptide isolated from Australian octopus.
- Successful chemical synthesis and recombinant production.

The invention relates to **pharmaceutical and cosmetic compositions** comprising these proteins, as well as to a method for identifying compounds effective for the treatment or prevention of ageing and age-related diseases



Methods and kits for the prognosis of colorectal cancer

Pub No.: ES2475366 B1

- Methods for predicting the risk of relapse in patients with colorectal cancer, as well as patients with colorectal cancer, as well as methods for providing personalized medicine to such patients, based on the expression levels of the ACSL1, ACSL4 and ACSL1, ACSL4 and, optionally, GCNT3, LPL, APOC1, SCD, whose expression products are involved in cellular energy metabolism.
- The invention also relates to kits for carrying out the predictive medicine and other methods.

Composition for the reduction of metabolic decline associated with aging

Treatment of disorders related to lipid metabolism

Pub No.: ES 2739133 B2
Application No.: P201830740

- Compositions comprising extract of *Rosmarinus officinalis* and other plants, as well as to nutritional supplements comprising such compositions
- Use of such compositions for the reduction of metabolic decline and of pathologies resulting from such decline.

Medical uses of Apolipoprotein A and activators thereof

Pub No.: US 2020/0378993 A1
Application No.: 16/491.948

Medical uses of apolipoprotein A and activators for the preparation of a medicinal product for the treatment or prevention of cancer. The invention also relates to a method for determining the stage of a colorectal tumor in a patient.

Apolipoprotein A, a mimetic peptide thereof, or an activator thereof are capable of inhibiting the proliferation, migration, and invasion of cancer cells, particularly cancer cells having an overexpression of ABCA1.

Patients diagnosed with tumors in advanced stages of the disease have decreased ApoA1 expression levels in a tumor sample with respect to patients diagnosed with tumors in earlier stages. Patients suffering from metastasis have decreased plasma ApoA1 levels with respect to patients diagnosed with a primary tumor.

In vitro method for screening, diagnosis and prognosis of colorectal cancer

Application No.: EP22382471.5

- Plasma expression profile analysis of metabolic health related genes in EOCRC patients showing sex intrinsic disparities.

Formulations comprising lipid systems carrying bioactive compounds

Immunotherapy potentiators or adjuvants for patients with cancer or immunological disorders

Pub No.: US 11478008
Application No.: 16/065.639

- The lipid system of the present invention is a self-emulsifying system that forms microemulsions during digestion together with bile salts and phospholipids, forming mixed micelles that stabilize the bioactive components during digestion.
- Prevents their precipitation or interaction with absorption inhibitors and thus increasing their bioaccessibility, bioavailability and, consequently, their bioactivity.





Innovation & Education

IMDEA Food is greatly involved in many education activities, promoting, and implementing different programmes along with various EIT Food partners. These programmes are aimed at current and future students as well as professionals either wanting to work or already working in the food sector. They are designed together with industry professionals and entrepreneurs to offer:

- Career development by taking part in a range of courses for professional development to keep up-to-date and develop new skills.
- Global challenges solving skills by co-creating new solutions to transform the food system and have real impact in the world.
- Business creation and growth with our courses for entrepreneurs and SME owners, helping you to transform towards a more sustainable future.
- Learning by joining one of our online courses about the food system and how future trends will change how we produce and consume food.

PROJECTS IN FOCUS

1. EIT Food Projects

IMDEA Food role within EIT Food guides and accelerates the innovation process that will transform the food system. We are committed to overcome low consumer trust, create consumer-valued food for healthier nutrition through Precision Nutrition, build a consumer-centric connected food system and enhance sustainability through promotion of a circular Bioeconomy.

2. Food Systems Master of Science Programme (MFS)

Participants in this two-year Master develop in-depth knowledge about food systems through studying consecutively at three distinct European academic institutions and use their newly acquired knowledge to drive the future transformation of the food system. The programme is based on a combination of essential entrepreneurial skills, which helps participants to become effective innovators, and key technical skills that are tailored to their career ambition in the sector.

3. RIS Professional Development: WE Lead Food

This programme is creating a network of women leaders who wish to drive change, innovation and sustainability within the food sector as we face many supply chain challenges. The WE Lead Food Programme is designed to equip the participants with the tools to make that difference and achieve results. Since 2021, WE Lead Food is part of the endeavor to support talent and leadership within the RIS-Regional

Innovation Scheme(RIS) countries. The network is open to all discipline backgrounds; research, business, policy, civil society members.

4. Food Solutions: Develop Healthy Food

Food Solutions brings together multi-disciplinary teams to tackle real-life industry challenges and develop innovative new solutions for the food system. Participant teams are mentored by industry experts and lessons delivered by the academic partners to equip them with the specialist knowledge they need to tackle their challenge. This is paired with a thorough course on innovation and entrepreneurship, led by world experts, to take students through their entrepreneurial journey from scoping out a potential market to pitching their final concept to industry at the end of the programme.

The actual food challenge relates to developing new products for healthier lives. These products have to be functional foods not in liquid form, and they have to be designed to target an specific segment of the population and its nutritional needs, following EU healthy nutritional regulations.

5. HEI Initiative: Innovation Capacity Building for Higher Education

This initiative is a key objective for EIT as part of its new strategy, the EIT Strategic Innovation Agenda (SIA) 2021-2027. The initiative aims to support higher education institutions with expertise and coaching, access to the EIT innovation ecosystem, and funding, enabling them to develop innovation action plans complementing the needs of individual higher education institutions. The initiative is a joint EIT Community activity coordinated by EIT Raw Materials. The Pilot Call for

Proposals 2021 invited European higher education institutions to design institution-wide action plans that will improve their entrepreneurial and innovation capacity across all institutional levels. By supporting such activities, this new EIT initiative aims to create systemic impact, empowering HEIs to become regional engines of innovation and foster sustainable growth and jobs across Europe. The activities can focus on several themes, including:

- Fostering institutional engagement and change.
- Strengthening partnerships between higher education, business and research organizations.
- Developing innovation and business support services.
- Enhancing the quality of entrepreneurial education.
- Creating and disseminating knowledge.

IMDEA Food is part of the HEADLINES (Higher Education Accelerating Directed Learning in Nurturing Entrepreneurship) consortium within the HEI Initiative along with Universidad de Burgos, Universidad Autonoma de Madrid, Munster Technological University, Centria (University of Applied Sciences) and Mashauri. The partnership develops and implements different activities promoting entrepreneurship among students, academics and researchers along the Food and Health sectors. IMDEA Food has designed and delivered various activities during 2022, including mentoring programmes for start-ups in the Food and Health sectors, courses on Entrepreneurship for researchers, and it contributed to the implementation of the first hackathon organized in UAM campus, along with UAM Emprende. As a contributing institution to the regional food ecosystem, IMDEA Food also led the mapping of the Community of Madrid agrifood ecosystem.





Citizen Science

IMDEA Food aims to disseminate the Institute research results, leading to changes in society's behavior and attitudes towards a healthier and more sustainable food system. There is a low flow of information among scientists, industry, and end-users, which delays knowledge transfer, and prevents citizens from partaking in the creative process driving innovation. The Citizen Science area aims to catalyze the interaction between the IMDEA Food research community and relevant stakeholders.

- The IMDEA Food Institute, along with EIT Food vision, is building an inclusive and innovative community where the consumer can be actively involved. Together, we can deliver an innovative food sector that produces healthy and sustainable food and is trusted by society.
- All the citizen science activities are designed to engage with people to become agents of change in the food system to achieve our main objectives:
- Bringing Precision Nutrition science closer to society. The Institute will act as a knowledge broker to provide citizens with knowledge-based information that will enable them to make critical and informed decisions about their food and health.
- To raise awareness in society, through the new generations, of the importance of adopting healthy and sustainable lifestyles and their individual and societal impact.

PROJECTS IN FOCUS

Con|CIENCIA|Acción&Alimentación Program

"Filling the Gaps in Precision Nutrition for healthy and sustainable food"

With this institutional program, launched in 2022, IMDEA Food aims to raise awareness in society, through the new generations, of the importance of adopting healthy and sustainable lifestyles and their personal and social impact. Lifestyle habits are developed at an early age, mainly at school, and are crucial to prevent the development of diseases throughout life.

The complete sequencing of the Human Genome in 2022 has meant a step forward in Precision Nutrition. Although this new area of knowledge has been the hallmark of IMDEA Food since its origins in 2006, it is now when we are in the best position to make Precision Nutrition known to society as a health tool. According to the Institute's strategic lines of action, which is to bring science closer to society, IMDEA Food acts as a knowledge agent to provide citizens with scientifically based information to make informed and critical decisions about their diet and health.

In line with Citizen Science models, the new generations are in charge of communicating and educating families, friends and their social environment to bridge the current gap in scientific advances in the food field for the planet's health and sustainability. This citizen participation

program, peers-to-peers, turn the new generations into ambassadors of change.

The plan involves primary and secondary schools, educational communities, families, and social agents committed to training and disseminating healthy and sustainable food.

The program is aligned with European projects such as EIT Food. It promotes the search for collaborations through patronage and sponsorship of those partners interested in promoting knowledge about Precision Nutrition and healthy and sustainable food in various fields.

This program includes two lines of action.

1. Precision Nutrition as a tool to prevent or treat pathologies linked to nutrition and lifestyle. The complete sequencing of the Human Genome in 2022 has meant a step forward in Precision Nutrition. Although this new area of knowledge has been the hallmark of IMDEA Food since its origins in 2006, it is now when we are in the best position to make Precision Nutrition known to society as a health tool. This action revolves around realising informative activities and workshops in the Hospitals collaborating with the Institute.
2. Precision Nutrition for the younger generations. The plan involves primary and secondary schools, educational communities, families, and social agents committed to training and disseminating healthy and sustainable nutrition.

The activities developed are aligned with European strategic initiatives such as those carried out by EIT Food, of which IMDEA Food is a founding partner, and promote public-private collaboration of partners interested in promoting knowledge about Precision Nutrition and healthy and sustainable food in its various fields.





pr

objects in focus

precision nutrition
and aging

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precision nutrition
and cancer

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precision nutrition
and obesity

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precision nutrition
and cardiometabolic
health

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nutrition

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PRECISION NUTRITION AND AGING PROGRAMME

Metabolic Syndrome

Characterization of the molecular mechanisms of short-term fasting against cancer and metabolic syndrome (FASTMET).

Principal Investigator: Dr. Pablo J. Fernández-Marcos

Funded by: Spanish Ministry of Science and Innovation.

Duration: 01/09/2021 - 31/08/2024

Call: 2019 R&D&I Projects. Social Research Challenges.

Ref: PID2020-114077RB-I00.



Nutritional Interventions

Gut Finder, an AI-based technology for Healthy Aging.

Principal Investigator: Alberto Díaz-Ruiz

Research Member: Rafael de Cabo

Funded by: Fundación Ramon Areces

Call: XXI Convocatoria Ciencias de la Vida y la Materia

Duration: 2023-2026

IDEAS222846DIAZ, Boosting the therapeutic potential of fasting in combination with mitochondrial inhibitors: re-shaping tumor metabolism to a cell death-end route. Principal Investigator: Alberto Diaz-Ruiz

Research Member: Rafael de Cabo

Funded by: Asociación Española Contra el Cáncer - AECC

Duration: 2022-2024.

PID-2019-106893RA-100, From Aging Biology to Sustainable Interventions: a microbiome-based approach.

Principal Investigator: Alberto Díaz-Ruiz

Research Member: Rafael de Cabo

Funded by: Ministry of Science and Innovation.

Duration: 2020-2024.



Transactional Venomics

Molecular characterization of a novel senolytic marine protein as a potential therapy for the Hutchinson-Gilford progeria syndrome.

Principal Investigator: Dr. Maria Ikonomopoulou

Funded by: Regional Government of Madrid/Grant for research talent attraction. Modality 1.

Duration: 2023-2024.

5th Year Extension Talento Award mod 1 (#2022-5A/BIO-24228).

Molecular characterization of the therapeutic potential of an octopus-venom peptide against melanoma.

Principal Investigator: Dr. Maria Ikonomopoulou

Funded by: Spanish Ministry of Science

Call: National Plan Grant (#PID2021-1266910B-I00).

Duration: 2022-2025.

European Venom Network (EUVEN)

Principal Investigator: Dr. Maria Ikonomopoulou (Stakeholder Engagement Coordinator & Core Management Committee)

Duration: 2020-2024

The overarching aim of the EUVEN COST Action is to foster venom investigation at the European level. The Action will identify priority targets and promising innovative approaches, develop best practice pipelines ensuring consistency across Europe and providing international standards in venom research.

Youth Funding Program. # PEJ-2020-AI/BIO-17904

Principal Investigator: Dr. Maria Ikonomopoulou

Funded by: Regional Government of Madrid

Duration: 2021-2023



New diagnostic and therapeutic tools against multidrug resistant tumours (STRATAGEM)

Principal Investigator: Dr. Maria Ikonomopoulou

Duration: 11/09/2018-10/09/2022

Funded by: H2020 (COST)

Call: COST Actions Ref. CA17104 Web: <https://stratagem-cost.eu/>

Funded by: H2020 (COST)

Call: COST Actions Ref. CA19144

STRATAGEM will build the first multidisciplinary network – to include academic laboratories, research institutes, and small and medium enterprises (SMEs), with a wide range of high-level and non-overlapping expertise – that will aim to improve both the diagnosis and therapy of multidrug resistant (MDR) solid tumours.



Posttranscriptional Regulation of Metabolic Diseases

Role of RBPs in the regulation of cholesterol metabolism and associated diseases.

Principal Investigator: Dr. Cristina M. Ramírez

Funded by: Ministerio de Ciencia e Innovación. Spanish Ministry of Science, Innovation and Universities

Duration: 2022-2025

Call: RTI 2021

Ref: PID2021-1282640B-I00

Study the role of miR-7/hnRNPK in the regulation of cholesterol homeostasis and their implication in dysregulated metabolic states associated with human diseases.

Principal Investigator: Dr. Cristina M. Ramírez

Funded by: Community of Madrid

Duration: 2022-2023

Call: Grants for the implementation of contracts "Talent Attraction" Modality 1; 5^º year.

Ref: 2021-5A/BMD-20964

New posttranscriptional regulators as a molecular link between diabetes, obesity and Alzheimer's disease.

Principal Investigator: Dr. Cristina M. Ramírez

Funded by: Spanish Ministry of Science, Innovation and Universities

Duration: 2019-2022.

Call: RTI 2018

Ref: RTI2018-095061-B-I00.

Role of Neuroendocrine miR-7 in the regulation of insulin signaling brain: Implications in diabetes and Alzheimer's Disease.

Principal Investigator: Dr. Cristina M. Ramírez

Funded by: Community of Madrid

Duration: 2018- 2022

Call: Grants for the implementation of contracts "Talent Attraction" Modality 1.

Ref: 2017-T1/BMD-5333

Cellular and Molecular Gerontology

Gut Finder, an AI-based technology for Healthy Aging.

Principal Investigator: Alberto Diaz-Ruiz.

Funded by: Fundación Ramon Areces.

Duration: 2023-2026.

Call: XXI Convocatoria Ciencias de la Vida y la Materia.

RYC2021-033751-I, Biology of Aging: Mechanisms and Interventions to promote Healthy Aging and Longevity.

Principal Investigator: Alberto Diaz-Ruiz.

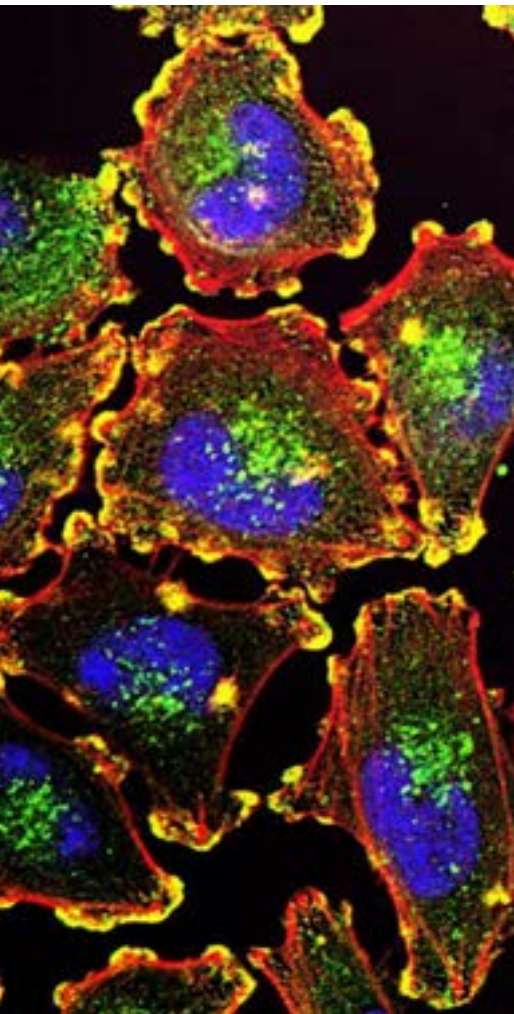
Funded by: Ministry of Science and Innovation (RYC2021 Program).

Duration: 2023-2028.

IDEAS222846DIAZ, Boosting the therapeutic potential of fasting in combination with mitochondrial inhibitors: re-shaping tumor metabolism to a cell death-end route. Principal Investigator: Alberto Diaz-Ruiz.

Funded by: Asociación Española Contra el Cáncer – AECC

Duration: 2022-2024.



PID-2019-106893RA-100, From Aging Biology to Sustainable Interventions: a microbiome-based approach.

Principal Investigator: Alberto Díaz-Ruiz.

Funded by: Ministry of Science and Innovation.

Duration: 2020-2024.

PRECISION NUTRITION AND CANCER PROGRAMME

Molecular Oncology

NUTRISION-CM. Precision nutritional strategies to reactivate the impaired immune system as a result of age, obesity or chemotherapy.

Coordinator Group Principal Investigator: Dr. Ana Ramírez de Molina (IMDEA Food)

No coordinator Group Principal Investigators: Dr. Elisa Carrasco and Dr. Maria Mittelbrum (CBM_UAM_CSIC)

Funded by: Community of Madrid Call: 2020 R&D Sinergy Grants

Duration: 01/07/2021-30/06/2024

Ref: Y2020/BIO-6350

This project aims to design Precision Nutritional strategies to slow down the decline of the immune system as a consequence of age, obesity or chemotherapeutic treatments in collaboration with the Immunometabolism and Inflammation Lab at CBM.

Nutritional strategies and bioactive compounds to target lipid metabolism alterations in cancer: Platform of Patient derived Paired Organoids for Precision Nutrition.

Principal Investigator: Dr. Ana Ramírez de Molina

Funded by: Ramon Areces Foundation

Duration: 03/04/2019 – 31/12/2022

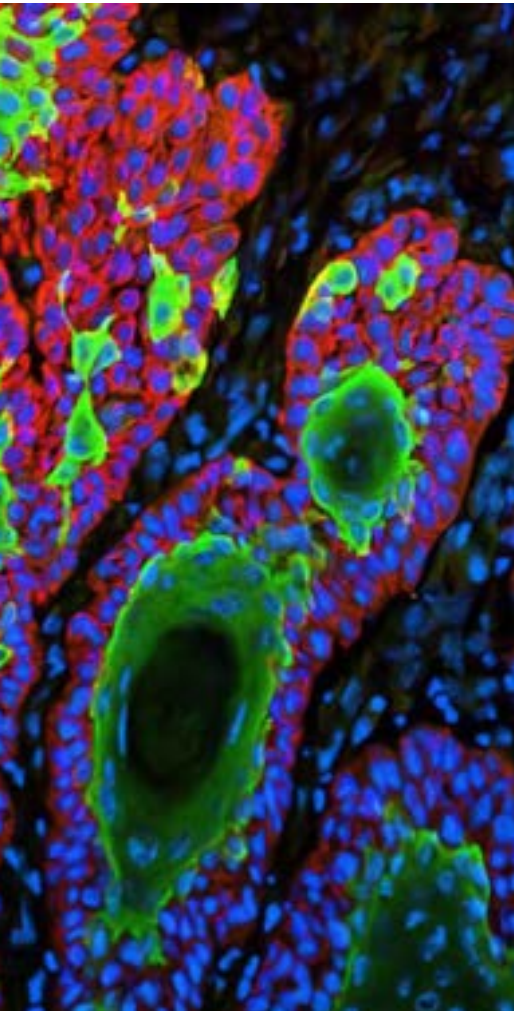
Partner: Infanta Sofia University Hospital

Call: 2018 Research in Life and Matter Sciences

Ref: CIVP19A5937

The constitution of a Platform of Patient derived Paired Organoids in collaboration with the Medical Oncology Service of Infanta Sofia Hospital is being constituted within this project for the analysis of lipid metabolism alterations in cancer and identification of the most appropriate molecular nutritional approach for its specific metabolic alteration.





FORDISCOVERY. Development of precision food formulations for colon cancer treatment.

Principal Investigator: Dr. Ana M^a Ramírez de Molina

Funded by: Spanish Ministry of Science, Innovation and Universities

Duration: 01/06/2020 – 31/05/2023

Partner: Infanta Sofía University Hospital

Call: PID 2019

Ref: PID2019-110183RB-C21

This project aims to contribute to the improvement of cancer treatment through precision nutritional products developed for specific groups of patients according to their metabolic alterations. It develops and demonstrates the efficacy of precision nutritional formulations by using computational models to identify the most appropriate bioactive compounds for each type of patient according to their metabolic alterations, as well as in vitro systems, and clinical trials to demonstrate their effectiveness.

OnCOVinf Project - ALIBIRD2020-CM

Principal Investigators: Dr. Ana Ramírez de Molina (ONCOGENOM) and Dr. Enrique Casado (HUIS)

Funded by: Community of Madrid and co-funded by EU Structural Funds ERDF/ ESF, "A way to make Europe"/"Investing in your future").

Duration: 01/01/2019-30/04/2023

Partner: Infanta Sofía University Hospital

Call: Technologies 2018, R&D Activities among Research Groups of Comunidad de Madrid

Ref: S2018/BAA-4343

This project arises from the urgent need to carry out actions in the field of research aimed at combating the effects of the COVID-19 infection. Cancer patients undergoing antitumor treatment are at high risk of developing infections, more accentuated in the current situation due to COVID-19 pandemic. Within the frame of ALIBIRD-2020 (Precision nutrition approaches for cancer patients), we are conducting this randomized, double-blind, placebo-controlled clinical trial for the evaluation of a precision immune-enhancing nutritional supplement in the prevention of infections during the Covid-19 pandemic in cancer patients receiving antitumor treatment.

Early Onset Colorectal Cancer (EOCRC): Nutri-metabolic score biomarker of cancer development and progression

Principal Investigator: Dr. Ana Ramírez de Molina

Main collaborator EO CRC: Dr. José Perea (IBSAL)

Funded by: Community of Madrid

Partners: HUIS, HULP, IBSAL

Ref: S2018/BAA-4343 & H2020 COST Action Ref. CA17118

Analysis of the relationship between lifestyle factors (nutrition, physical activity), genetics (individual susceptibility), the consequent global metabolic state (healthy/unhealthy), and relationship with chronic inflammation and the immune response, as well as the development, progression, and response to treatment of patients with cancer, with special focus on early onset CRC (population under 50). Development of a Nutri-metabolic score related to metabolic health as a new integrative biomarker of cancer development and progression of diet related tumors, mainly focused on colorectal cancer, lung and pancreatic cancer.

Evaluation of non-invasive markers of thermogenesis as predictive factors for the development of cachexia in cancer patients

Principal Investigator: Dr. Ana Ramírez de Molina

Main collaborators: Dr. Jaime Feliú, Dr. Enrique Casado

Partners: Infanta Sofía University Hospital, La Paz University Hospital

Previous results from our laboratory highlight that the evaluation of thermogenesis activation markers in plasma cancer patients has great potential as an effective tool for the stratification of patients at high risk of developing cachexia during the tumoral process. In this future project, the application of selected non-invasive molecular biomarkers associated with the development of cachexia will promote the application of early precision nutritional interventions, which would delay and avoid the patient's functional impairment and mortality associated with cancer cachexia.

Health4Brain Precision nutrition for the maintenance and improvement of cognitive function

Principal Investigators: Dr. Ana M^a Ramírez, Dr. Carolina Maestre, Dr. Isabel Espinosa, Dr. Guillermo Reglero

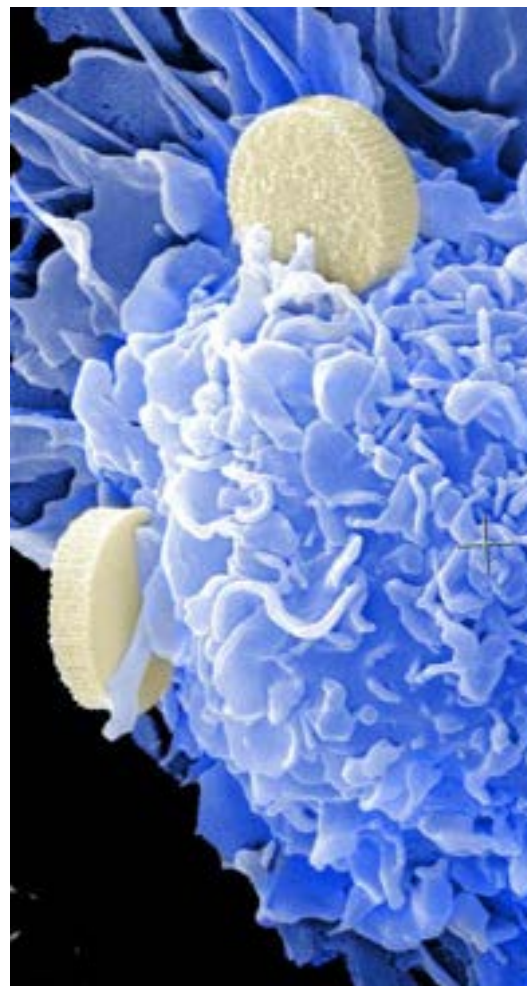
Funded by: Spanish Ministry of Science, Innovation and Universities

Duration: 01/04/2020-31/03/2023

Partners: P4H S.L, Natac Biotech S.L and IMDEA Food.

Call: Collaboration Challenges Programme. RTC 2019 Ref: RTC2019-007294-1

HEALTH4BRAIN is an innovative project that is developing a nutrigenetic test that will make it possible to offer precision nutrition recommendations aimed at maintaining and improving cognitive function. The IMDEA Food Institute in collaboration with the companies PRECISION FORHEALTH, SL and NATAC BIOTECH SL make up the consortium of the HEALTH4BRAIN project





that will work for three years with the aim of contributing to the personalization of the diet to improve the health and quality of life of the population, helping to maintain and improve their cognitive function. The project is designing personalized genetic tests and associated nutritional recommendations and functional foods to improve cognitive function and inhibit cognitive decline, which will be validated in a nutritional intervention study developed by IMDEA Food.

THYROID CANCER RESEARCH LINE

YAP in thyroid cancer: role in tumorigenesis and progression of the disease and its implication in drug response

Principal Investigator: Dr. María E. Rodríguez García-Rendueles

Funded by: Community of Madrid

Duration: 01/09/2020 -31/08/2024

Call: Grants for the implementation of contracts "Talent Attraction" Modality

Ref. 2019-T1-BMD-13039

Clinical Oncology

OnCOVinf Project - ALIBIRD2020-CM

Principal Investigators: Dr. Enrique Casado (HUIS) and Dr. Ana Ramirez de Molina (IMDEA Food).

Funded by: Community of Madrid and co-funded by EU Structural Funds ERDF/ ESF, "A way to make Europe"/"Investing in your future".

Duration: 01/01/2020-31/12/2022.

Call: Technologies 2018, R&D Activities among Research Groups of Comunidad de Madrid

Partner: Infanta Sofia University Hospital (HUIS).

This project arises from the urgent need to carry out actions in the field of research aimed at combating the effects of the COVID-19 infection. Cancer patients undergoing antitumor treatment are at high risk of developing infections, more accentuated in the current situation due to COVID-19 pandemic. Within the frame of ALIBIRD-2020 (Precision nutrition approaches for cancer patients), we are conducting this randomized, double-blind, placebo-controlled clinical trial for the evaluation of a precision immune-enhancing nutritional supplement in the prevention of infections during the Covid-19 pandemic in cancer patients receiving antitumor treatment. As secondary objectives effects on metabolic, inflammatory and immune axis are being evaluated.

mHealth platform for the personalized follow up of cancer patients - ALIBIRD2020-CM Project.

Principal Investigators: Dr. Enrique Casado (HUIS) and Dr. Maria Sereno (HUIS)

Funded by: Community of Madrid and co-funded by EU Structural Funds ERDF/ ESF, "A way to make Europe"/"Investing in your future").

Duration: 01/01/2020-31/12/2022

Call: Technologies 2018, R&D Activities among Research Groups of Comunidad de Madrid

Partners: Infanta Sofia University Hospital (HUIS), GBT (UPM), ALIMENTA (CSIC), ONCOGENOM & GENYAL LAB (IMDEA Food), INGREEN (UAM).

Within the frame of ALIBIRD2020-CM (Precision nutrition approaches for cancer patients), we are developing a platform with a dual application to cancer patients and oncologists to monitor patient reported outcomes, treatment response and lifestyle of cancer patients, as well as automatic customized clinical advice based on inputs and specific disease, with a special focus on nutrigenetics, diet, physical activity and microbiome.

Clinical-pathological and molecular characterization of long-term survivors with advanced non-small cell lung cancer.

Principal Investigator: Dr. Maria Sereno

Duration: 2019-2023

Partners: Infanta Sofia University Hospital, Ramon y Cajal University Hospital, San Carlos University Hospital, Gregorio Marañon University Hospital, 12 de Octubre University Hospital, Alcorcon Foundation Hospital, Principe de Asturias University Hospital, La Paz University Hospital and Torrejon University Hospital

Long-term survivors (LS) of non-small cell lung cancer (NSCLC) without driver alterations, displaying an overall survival (OS) of more than 3 years, comprise around 10% of cases in several series treated with chemotherapy. There are classical prognosis factors for these cases, but more data are required in the literature. We conduct a multi-center study to perform a clinical-pathological and molecular characterization of these patients.

Study for the evaluation of a short fast on chemotherapy toxicity and efficacy.

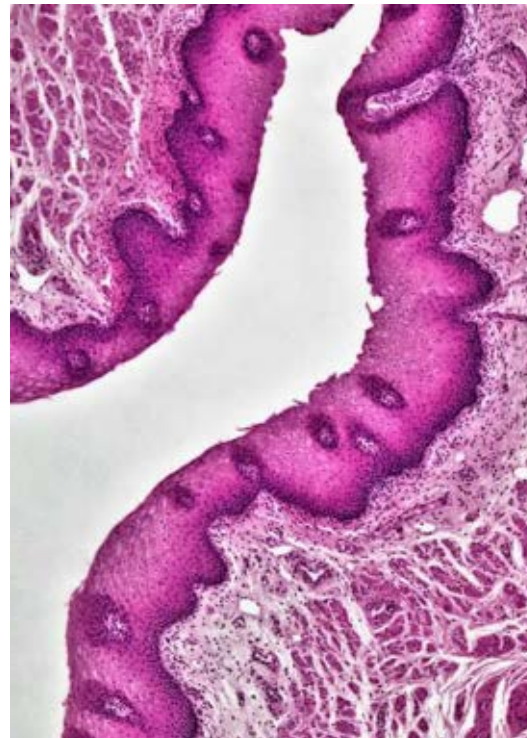
Principal Investigator: Dr. Francisco Zambrana and Dr. Pablo J Fernandez

Funded by: Community of Madrid and EU Funds (S2018/BAA4343)

Duration: 2020-2022

Partner: Infanta Sofia University Hospital, La Paz University Hospital, IMDEA Food

This is an open randomized clinical trial comparing a short duration fast of 48 hours around chemotherapy prescription, versus no fast, in colorectal cancer patients, evaluating clinical toxicity and quality of life, as well as p21 induction -together other target genes- and immune cell populations.



Molecular Immunonutrition

Understanding the dynamic interplay of improved food formulations with immunonutritional benefits in the prevention and onset of liver (FOOD4IMNUT) (PID2019-107650RB-C22)

Principal Investigator: Dr. Moisés Laparra

Funded by MICINN. Partners: Agrochemistry and Food Technology Institute (IATA-CSIC).

Duration: 2020 – 2023

Dysfunction aims to provide further clarification of the dynamic interplay and consequences of replacement of critical ingredients in food formulations on cellular innate immune signaling and biology. The production of foods with an added value to shape lipid homeostasis through an adequate innate immune control will pave the way towards the development of nutritional intervention strategies with preventive and/or therapeutic potential in NCCD that should be preferable to the classical pharmacological approach. To this end, Subproject_2 takes advantage of preclinical models to determine the influence of food ingredients on immune function and the onset and severity of NCCD. Human intervention studies, as gold standard in nutrition, will be used to define the immunonutritional pattern in normal weight and in obese.

Desarrollo de ingredientes alimentarios a partir de cultivos ancestrales iberoamericanos (IA VALSE-FOOD) (119RTOS67)

Principal Investigator: Dr. Moisés Laparra

Funded by: CYTED.

Duration: 2021 – 2024

Partners: 50 groups between companies, industrial/consumer associations and researchers from Argentina, Brazil, Chile, Colombia, Cuba, Ecuador, Spain, Guatemala, Mexico, Paraguay, Peru and Portugal.

Focuses on the design, preparation, and evaluation of healthy foods for vulnerable groups of populations, using validated ingredients and treatments improving the functional properties of foods.

Consortium for the study of renal failure and its impact on cardiovascular pathology (CIFRA-COR-CM) (P2022/BMD-7223)

Funded by: Comunidad de Madrid

Duration: 2023 – 2027

Partners: Institute of Biomedicine 'Alberto Sols' (CSIC), Hosp. 12 de Octubre (Madrid), Hosp Ramón y Cajal (Madrid), Hosp Gregorio MArañón (Madrid), Complutense University of Madrid, Autonomous University of Madrid.



Search for nephroprotective strategies to prevent acute renal failure from different causes and origins. It is a serious syndrome due to its high prevalence and mortality; especially when complicated by dysfunction of other organs, such as the heart. Thus, heart failure can appear both in the short and long term after acute renal failure. "For this reason, both clinical situations should not be considered as different entities, but as phases of a common and continuous process in which nephroprotective intervention is possible to prevent the adverse effects of this renal pathology."

Computational Biology

Ai4food-CM (Artificial Intelligence for the Prevention of Chronic Diseases Through a Personalized Nutrition)

Principal Investigator: Dr. Enrique Carrillo de Santa Pau

Funded by: Regional Government of Madrid Y2020/TCS-6654. 2021-2024

Duration: 01/07/2021-30/06/2024

Partners: GENYAL Platform (IMDEA Food) and BiDA Lab (UAM)

The AI4Food project aims to break the limits of current personalized nutrition, to give rise to a new generation of technologies focused on modeling users' habits, molecular biology, and the expert knowledge of nutritionists. AI4Food will develop a series of enabling technologies to process, analyze and exploit a large number of biometric signals indicative of individuals' habits, phenotypic and molecular data. The main objective of AI4Food is to integrate all this information and develop new machine learning algorithms to generate a paradigm shift in the field of nutritional counselling. It seeks to develop a new generation of digital tools to assist in personalized decision making in the field of nutrition. These tools will allow a more objective and effective assessment of people's nutritional status, helping experts to propose changes towards healthier eating habits from general solutions to personalized solutions that are more effective and sustained over time for the prevention of chronic diseases.

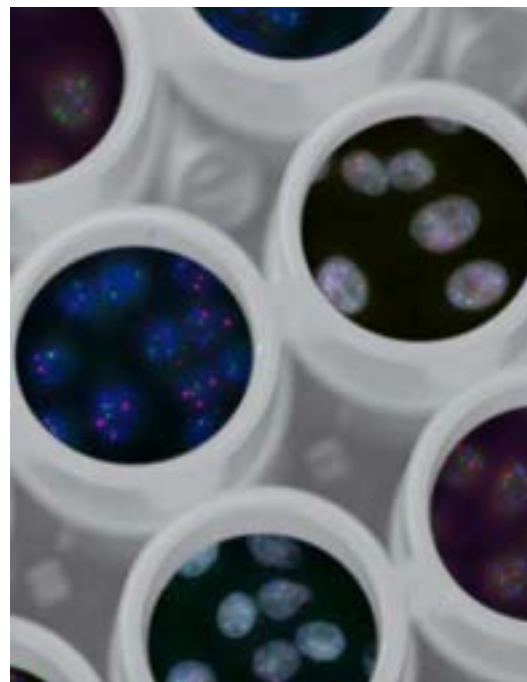
FORDISCOVERY. (Chronic DiSease COntrol through VERY effective nutritional FORmulae)

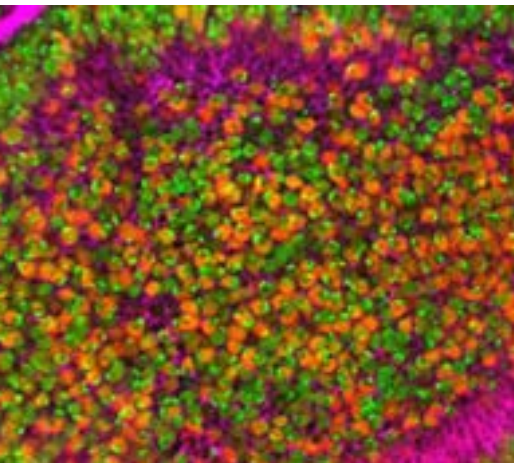
Researchers involved: Dra. Teresa Laguna & Dr. Enrique Carrillo de Santa Pau

Funded by: Proyectos I+D+i 2019 - Retos Investigación. (PID2019-107650RB-C22). Ministerio de Ciencia, Innovación y Universidades

Duration: 01/06/2020-31/05/2023

Our current work in this project, leaded by Dra. Ana Ramírez de Molina (Molecular Oncology Group), is focused on apply computational resources to suggest specific bioactives supplementation strategies for subgroups of cancer patients. It is widely known that specific DNA methylation profiles show more variable levels of methylation in several cancer types, which allows the





identification of cancer subtypes. Currently, we are studying the variability in CpG methylation of TCGA colon adenocarcinoma samples (COAD) (Fig.1), classifying them according to meta-clustering techniques (Fig. 2). Furthermore, we characterize the subgroups by analysing their transcriptional profiles, which are compared to transcriptomic data of bioactive studies to find biocompounds with an opposite profile to the specific COAD subgroups, which may have a beneficial effect on patients by counteracting their cancer expression profile.

PRECISION NUTRITION AND OBESITY PROGRAMME

Nutritional Genomics and Epigenomics

DIMENSION

Principal Investigator: José M^a Ordovás

Duration: 01/01/2019 – 31/12/2022

Funded by: Proyectos De I+D+I, <<Programación Conjunta Internacional Pci2018-093009

DIMENSION is a European project developed in collaboration with 5 groups from international excellent research institutions. The DIMENSION consortium studies dynamically the causal impacts of dietary intake on epigenetic regulation of gene function across tissues, and their impact on subsequent cardio-metabolic health outcomes. Within the proposal, we focused on postprandial changes in DNA methylation marks after a meal tolerance test combining data from PREDICT and CORDIOPREV cohorts. The aim is to tackle the causal relationships between diet, epigenetic modifications, and gene function. DNA methylation marks are supposed to be stable, and it has been traditionally stated that a long-term exposure is needed to change DNA methylation marks. In this study, we demonstrate that DNA methylation marks change in a few hours after a food intake, suggesting that DNA methylation is a dynamic epigenetic mechanism able to modulate gene expression in response to food intake in the short term. We found changes in methylation marks related to adipogenesis and inflammation that corresponded with changes in the expression of target genes.

CIBERobn: Big data, Artificial Intelligence, Obesity and Nutrition

Principal Investigator: José M^a Ordovás

Duration: 01/01/2022 –

Funded by: CIBERobn, which is an initiative of Instituto de Salud Carlos III.

The research group has been incorporated to CIBERobn consortium. Within the consortium, the research group will i) promote the integration of artificial intelligence in ongoing and new nutritional intervention studies to better characterize the individual phenotype and response to lifestyle interventions; ii) develop new scores based on omics data and with high specificity and sensitivity to predict disease progression and response to intervention and iii) integrate epigenetic data as biomarkers and outputs in nutritional intervention studies. These objectives will be reached through the incorporation of “deep phenotyping” and “advanced computational biology” to large dataset including cohort and interventional studies.

Cardiovascular and Nutritional Epidemiology

Olive oil is the predominant fat source in the Mediterranean countries and plays a major role in explaining the associations of the Mediterranean diet with the reduction of chronic diseases risk.

The purpose of this study was to examine, in a relatively large population of older adults from Spain, the prospective association of consumption of olive oil, and its main types, with the risk of frailty. Data were obtained from the Seniors-ENRICA I cohort study. A total of 1,896 older adults aged 60 and over were recruited in 2008-10 and follow-up through 2013. At baseline, olive oil and other food consumption was collected using a validated dietary history. Incident frailty was defined as having at least three of the following five Fried-based criteria: low physical activity, fatigue, slow walking, muscle weakness and unintentional weight loss.

Over a mean follow-up of 3.5 years, 135 incident frailty cases were identified. The odds ratio OR (95% confidence interval) of frailty risk when compared extreme tertiles of total olive oil consumption was OR 0.47 (0.29, 0.78), *P* trend 0.003. When differentiating by olive oil types, the results held for virgin olive oil was OR 0.52 (0.30-0.88), *P* trend 0.013. For common oil consumption, statistical significance was not achieved.

In conclusion, the highest total olive oil consumption (83 tablespoons), especially if virgin, was associated with half the risk of frailty as the lowest consumption (21 tablespoon) among older adults. This study suggests that virgin olive oil should be the preferential culinary olive oil type for frailty prevention. If confirmed in other settings, small doses of virgin olive oil could be added as a simple geriatric nutritional advice on the prevention of frailty.





INFLUENCE OF DIET ON THE DEVELOPMENT OF CARDIOMETABOLIC DISEASES RESEARCH LINE

Raw, boiling, roasting, and pan-frying are the cooking methods associated with a healthier cardiometabolic profile in an older adult population from Spain.

The aim of this study was to evaluate, in a large population of older adults from Spain, the association between cooking methods and anthropometrics, cardiovascular risk factors, and cardiac damage biomarkers. Data were taken from 2476 individuals aged ≥ 65 from the Seniors-ENRICA 2 cohort in Spain and recruited between 2015 and 2017. Eight cooking methods (raw, boiling, roasting, pan-frying, frying, toasting, sautéing, and stewing) were assessed using a face-to-face validated dietary history. Participants were categorized according to sex-specific quintiles of food consumed with each cooking method. The associations were summarized as adjusted percentage differences (PDs) in anthropometrics, cardiovascular risk factors, and cardiac damage biomarkers, by using marginal effects from generalized linear models.

In this large population of older adults from Spain, the most frequently cooking methods were raw, followed by boiling, roasting, and pan-frying. The PDs corresponding to raw food consumption were -13.4% (p-trend: <0.001) for weight, -12.9% (p-trend: <0.001) for body mass index (BMI), -14.8% (p-trend: <0.001) for triglycerides, and -13.6% (p-trend: <0.115) for insulin. PDs for boiled food consumption were -13.3% (p-trend: <0.001) for weight, -10.0% (p-trend: <0.001) for BMI, and -20.5% (p-trend: <0.001) for insulin. PDs for roasted food consumption were -11.1% (p-trend: <0.001) for weight and -23.3% (p-trend: <0.001) for insulin. PDs for pan-fried food consumption were -18.7% (p-trend: <0.019) for insulin, -15.3% (p-trend: <0.094) for pro-B-type natriuretic peptide amino-terminal, and -10.9% (p-trend: <0.295) for troponin T. No relevant differences were observed for blood pressure nor for other cooking methods.

In conclusion, raw, boiling, roasting, and pan-frying were associated with a healthier cardiometabolic profile. These results highlight the importance of cooking methods and their potential benefits in cardiovascular prevention. More studies are needed to establish causality and to fully understand the impact of cooking methods on health.



NUTRITION AND OMIC DETERMINANTS OF FRAILITY, MULTIMORBIDITY AND UNHEALTHY AGING RESEARCH LINE

Leucine intake and risk of impaired physical function and frailty in older adults

Background: Leucine is suggested to play a central role in age-related physical decline, but the effect of dietary leucine intake on physical functioning is uncertain. We examined the prospective association between dietary leucine intake and impaired lower-extremity function (ILEF) and frailty in older adults.

Methods: We used data from 2956 adults aged ≥ 60 years from the Seniors-ENRICA cohort. At baseline (2008–2010) and in 2012, dietary information was obtained with a validated computerized face-to-face diet history, from which energy-adjusted cumulative leucine intake per body weight was calculated. Participants were followed up through 2017 to assess incident ILEF, ascertained with the Short Physical Performance Battery, and incident frailty, according to the Fried phenotype criteria. Statistical analysis was performed with Cox models adjusted for the main potential confounders.

Results: During follow-up, we identified 515 incident cases of ILEF and 241 of frailty. Compared to participants in the lowest tertile of leucine intake (35.5–89.0 mg/kg/d), those in the highest tertile (107.4–372.5 mg/kg/d) had a lower risk of ILEF [fully-adjusted hazard ratio (95% confidence interval): 0.70 (0.53–0.93), p trend: 0.01] and of frailty [0.63 (0.41–0.96), p trend: 0.03]. A higher consumption of important sources of leucine in this population, including unprocessed beef, oily and white fish, and bread were also associated with a lower risk of incident ILEF and frailty.

Conclusions: Higher leucine intake was associated with reduced risk of ILEF and frailty. Dietary leucine, obtained from foods rich in high-quality protein, could be a key nutrient to prevent age-related physical function decline in older adults



Nutritional Control of the Epigenome

PREDIMED-Plus

PREDIMED-Plus is a multicentre, randomized, controlled, parallel groups intervention trial conducted in 23 research centres from Spain. Research centres include hospitals, universities and research institutions that join more than 200 professionals from medicine, nutrition, psychology, pharmacy, biology, and nurse to carry out a long-lasting lifestyle intervention to lose weight. The aim is to compare an intensive lifestyle intervention, based on energy-reduced



Mediterranean diet, physical activity, and behavioural support, with a control intervention, based on primary care, on the incidence of primary cardiovascular events (cardiovascular mortality, acute myocardial infarction, or stroke). PREDIMED-Plus study has recruited 6.874 participants, men (55-75 years) and women (60-75 years) with overweight/obesity and metabolic syndrome. For 6 years participants have followed specific intervention protocols, according to the allocation group. Intervention finished last December 31. Currently, the study is within the two additional years of follow-up without intervention.

The consortium has published more than 100 scientific papers, highlighting the cohort profile and the interim analyses. The prestigious journal Nature Medicine has exalted PREDIMED Plus as one of the 11 clinical trials that will shape the medicine in 2023.

ENSATI: reaching healthy aging through time-restricted eating

Principal Investigator: Lidia Daimiel

Funded by: MCIN/AEI/ 10.13039/501100011033 through Programa «Proyectos de Generación de Conocimiento», within the frame of Programa Estatal para Impulsar la Investigación Científico-Técnica y su Transferencia, del Plan Estatal de Investigación Científica, Técnica y de Innovación 2021-2023 in the call of 2021(PID2021-125899OB-I00). Project also funded by CIBER Fisiopatología de la Obesidad y la Nutrición, an initiative of Instituto de Salud Carlos III.

Duration: 01/09/2022 – 31/08/2025

Healthy aging refers to developing and maintaining functional abilities to enable the well-being of the elderly. Promoting healthy aging strategies in the population would result in people living in a healthy state for most of their lifespan. Healthy lifestyle habits could attenuate the progression of aging-related diseases and ameliorate age-related decline. Among the lifestyle interventions that could improve healthspan, time restricted eating (TRE) is a promising candidate. TRE is a type of intermittent fasting that involves time-limited consumption of food during a specific time window. This dietary intervention has a demonstrated positive impact on some aspects of health both in pre-clinical models and clinical trials. Autophagy is one of the main proteolytic systems implicated in protein quality control and this crucial activity for cellular homeostasis decreases with age. Therefore, the effects of TRE on different aspects of aging may be mediated by autophagic processes. Epigenetic mechanisms and immune senescence may also be influenced by TRE. We hypothesize that an intervention with TRE in overweight/obese individuals has a positive impact on their aging determinants. To test this hypothesis, we propose an intervention trial to compare the effect of a Mediterranean diet with or without caloric restriction and a TRE protocol based on a Mediterranean diet on molecular markers of aging. Details on TRE study can be found on its website: <https://ensati.wixsite.com/ensati> and through this QR code:



PRECISION NUTRITION AND CARDIOMETABOLIC HEALTH

Cardiometabolic Nutrition

METAINFLAMACION-CM

Principal Investigator: Dr. Alfredo J. Martínez

Funded by: Community of Madrid Call: 2020 Synergy Projects

Duration: 01/07/2021-30/06/2024

The objective of METAINFLAMACION project is the identification of new precision tools in patients with Lupus Erythematosus, COVID19, Obesity and Metabolic Syndrome, that will allow a better control of these inflammatory diseases favoring their clinical/ metabolic stratification and the prevention of associated complications through the use of early biomarkers and the personalization of the therapeutic management and the design of precision therapeutic interventions. In collaboration with Puerta de Hierro Majadahonda University Hospital and the Autonomous University of Madrid a total of 560 patients will be recruited for the 1) Phenotypically characterization of Lupus Erythematosus, COVID19, Obesity and Metabolic Syndrome patients and 2) Antiinflammatory precision nutritional intervention 32 weeks in patients with overweight to improve the health status of these patients.

NutriMDEA study

Principal Investigator: Dr. Alfredo J. Martínez

Funded by: IMDEA Food and FINUT

Duration: 2020-2023

This study aims to analyze the information on nutritional status aimed at personalizing individualized nutritional advice, with which an improvement in life and eating habits that improve the health of participants can be achieved by reducing the risk to develop future cardiometabolic diseases. In addition, potential low-cost, easy-to use markers can be obtained from the study results that can be applied in clinical practice for screening patients. A total of 15000 participants have accessed to the questionnaire available in an online platform where the volunteers can send the survey data. The results of this study may be integrated into clinical services and future





studies, allowing to determine the type of complementary information needed (from biochemical, metabolomic or genetic analysis) to achieve greater precision and personalization in nutritional counseling.

PLENUFAR 7

Principal Investigator: Dr. Alfredo J. Martínez

Funded by: Spanish General Council of Pharmaceuticals

Duration: 2022

The PLENUFAR 7 project's main objective is the development of tools that help in a precision nutritional approach through the integration of a set of personal factors that allow the qualitative definition of certain individual nutritional profiles or groups of people (Nutritypes). In addition, bioinformatic analysis techniques of personalized information will allow the development of computations or "scores" (Nutrindex) for the objective quantification of the sum of exposure factors that influence the nutritional status of everyone. A questionnaire will be carried out in pharmacies to analyze some health variables in all Spanish communities. These strategies could finally serve to define personalized metabolic and nutritional action guides for your advice through nutritional decision algorithms.

Dietary Deal

Principal Investigator: Dr. Alfredo J. Martínez

Funded by: Instituto de Salud Carlos III

Duration: 2021-2024

The main objective is to develop and open sources dietary assessment tools with machine learning capabilities for automatic classification for harmonization of dietary data across Europe and to advance on the ongoing biomarkers research in the area of nutritional status and health, specifically, this Project Will develop and open dietary assessment tools with addresses the needs for research related to epidemiology, clinical practice and for dietary surveillance with regards to both nutrition and Food safety aspect. This project Will also investigate factors potentially influencing the validity of dietary biomarkers (genetics, lifestyle, phenotype, other dietary factors) using existing cohort studies and estimate the impact of biomarkers correction on estimation of Food/ nutrient intake.

Bioactive Ingredients

Impact of milk fat globule membrane-enriched supplement on health in both in-vitro and in-vivo trials and its potential mechanisms of action (MFGM4HEALTH).

Principal investigator: Javier Fontecha Alonso

Funded by: Spanish Ministry of Science and innovation

Duration: 01/09/2021-02/09/2024

Partners: CIAL, IMDEA-Food, IGS

The multidisciplinary activities of the project will provide scientific evidence on the mechanisms of action of a MFGM-enriched product and potentially ascertain how MFGM function goes beyond its nutritional role. Hopefully, this research will provide data to build the bases for future human trials with appropriate MFGM formulations emphasizing both infant development and healthy ageing as well as confirmation of the anti-inflammatory and pyroptosis-preventive actions of MFGM. The core of the research team comprises tenured scientists from CSIC and IMDEA-Food. The groups have developed research lines in different but complementary issues within the Food Science and Technology and Molecular Nutrition fields, with a high level of knowledge and experience in food lipids, particularly in lipids from dairy products and human milk, and the evaluation of the physio-modulatory actions of micro-nutrients and their metabolism.

Epigenetics of Lipid Metabolism

Search and validation of plant microRNA from the diet with an atheroprotective effect.

Principal Investigator: Dr. Maria-Carmen López de las Hazas

Funded by: Spanish Society of Arteriosclerosis

Duration: 2022-2023

Epidemiological evidence suggests that adherence to diets rich in vegetables, especially from the brassica family, shows an atheroprotective effect, reducing the risk of suffering from associated cardiovascular pathologies. This effect has traditionally been associated with the bioactive components contained in said foods. It has recently been shown that microRNAs (miRNAs) from edible vegetables could influence consumer gene expression and cause a biological effect (cross-kingdom regulation). This project evaluates the impact of plant miRNAs on the regulation of lipid metabolism and its possible involvement in cardiovascular health. Advances in the knowledge of how plant miRNAs could modify lipid metabolism will increase the possibility of developing new dietary, therapeutic, and pharmacological approaches to combat the development of CVD.





Dairy industry by-products as a sustainable source of extracellular vesicles: nanocarriers for enhancing the bioavailability and bioactivity of (poly)phenols (DairyPhenosome).

Principal Investigator: Dr. Alberto Dávalos

Funded by: Spanish AEI

Duration: 2022-2024

Partner: CEBAS-CSIC (Murcia)

DairyPhenosome will allow the use of by-products (whey from different milk processes) to obtain innovative products with high added value for the industry (i.e extracellular vesicles). In addition, the subproject will develop a method to scale-up the production of EVs, and evaluate the advantages of nanoencapsulation of dietary phenolic compounds into EVs in terms of increase bioavailability, stability as native compound and bioefficacy compared vs. free (non-encapsulated) polyphenols which are highly metabolized limiting their bioactivity.

In general the project will impact the development of more effective strategies to obtain EVs from byproducts and save costs, focusing on improving health and relieve pressure on the health system.

The journey of edible plants-derived extracellular vesicles through the mammalian body: extracellular ncRNAs as potential bioactive components of foods (FoodVesicleTherapy)

Principal Investigator: Dr. Alberto Dávalos

Funded by: Spanish Ministry of Science, Innovation and Universities

Duration: 01/06/2020 – 31/05/2023

Call: PID 2019

Recently, various reports revealed that plant non-coding RNAs(ncRNAs)share a certain degree of similarity and exhibit perfect complementarity to mammals. Research is in progress to determine whether dietary ncRNAs act as bioactive molecules and may regulate target genes in other kingdoms (i.e., animals). However, to produce any biological effect, dietary ncRNAs must first resist the different steps of the digestion process; second, they would have to be taken up and distributed throughout the tissues until arriving at the target cell. At this point they would have to maintain the minimum dose required to regulate host gene expression and influence cell communication. The possibility of transferring ncRNAs by extracellular vesicles (EVs) would increase the probability of attaining this transference.

A better understanding of the mechanism that contribute to the resistance, absorption, biodistribution and biological effects of dietary ncRNAs transported in EVs may open-up novel plantbased ncRNA therapeutic approaches.

CHILDHOOD PRECISION NUTRITION PROGRAMME

Childhood Obesity

CIBEROBN National Network for the study of Obesity and Nutrition

Principal Investigator: Dr. Jesús Argente

CoPrincipal Investigator: Dr. Julie Chowen

Funded by: Institute of Health Carlos III (ISCIII) Ref.CB06/03/0022

Dr. Argente is coordinator of the pediatric obesity program.

Duration: 01/01/2006-present

Crosstalk between hypothalamic astrocytes and perivascular adipose tissue in metabolism and cardiovascular function: Impact of diet

Principal Investigator: Dr. Julie Ann Chowen King

Duration: 01/01/2018 - 30/09/2022

Funded by: Ministry of Economy and Competitiveness

Call: 2017 R&D+I Project

Astrocytes, exosomes and miRNAs in the differential response of males and females to specific fatty acids.

Principal Investigator: Dr. Julie Ann Chowen King

Duration: 01/09/2022 - 30/09/2026

Funded by: Ministry of Economy and Competitiveness

Call: 2021 R&D+I; Project Ref: PID2021-1226530B-I00

These two consecutive projects are focused on understanding the response of hypothalamic astrocytes to nutritional signals and how they communicate this information to the surrounding neuronal metabolic circuits. In addition, there is a special focus on how these systems differ between males and females.





**The study of newly identified regulatory factors in the GH/ IGF system:
Implications in human pathology, analysis of the underlying mechanisms
and development of potential therapies**

Principal Investigator: Dr. Jesús Argente Oliver

Duration: 01/01/2020 -31/12/2022

Funded by: Institute of Health Carlos III (ISCIII)

Call: Health Research Projects Ref. PI19/00166.

This project is focused on the response of the GH/IGF system, with special emphasis on new members of the system, to different metabolic conditions and diseases.





ople

people

Head of
programmes

110

Group
Leaders

114

Lab Technicians

121

Researchers

123

Ph.D researchers
& students

130

Innovation, transfer
& communication
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138

Management

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HEAD OF programmes



Jesús Argente Ph.D.

Childhood Precision Nutrition Programme Co-Director

Full Professor and Director of the Department of Pediatrics at the Universidad Autónoma de Madrid, Director of the Department of Pediatrics and Chairman of the Department of Pediatrics and Pediatric Endocrinology and Director of the Laboratory of Research at the Niño Jesús University Children's Hospital. Associate researcher of IMDEA Food. Director of the Childhood Precision Nutrition Program.

Dr. Argente is IP in the CIBER of Obesity and Nutrition, being the leader of the childhood obesity program. He obtained his medical degree at the University of Zaragoza and completed his pediatric residency at the Hospital Ramón y Cajal in Madrid and has worked at the Hospital Saint Vincent de Paul in Paris, France, the University of Virginia in Charlottesville, VA, USA and at the University of Washington in Seattle, WA, USA. His main research interests include childhood obesity, pathophysiology of human growth, puberty, eating disorders and diabetes. He has published more than 300 original articles and has lectured in more than 30 countries. He is past president of the European Society for Pediatric Endocrinology (ESPE) and past president of the Spanish Society for Pediatric Endocrinology (SEEP). He has obtained multiple national and international awards for his research.





Julie Chowen Ph.D.

Childhood Precision Nutrition Programme Co-Director

Investigator of the Community of Madrid Category A in the Department of Pediatrics and laboratory of Research at the Niño Jesús University Children's Hospital in Madrid. Associate researcher of IMDEA Food. Co-Director of the Childhood Precision Nutrition Program.

Dr. Chowen received her PhD in Physiology and Biophysics at the University of Washington in Seattle, Washington, USA. She obtained a postdoctoral position and later as a research associate at the Cajal Institute, CSIC, Madrid, Spain. She is currently President of the Scientific Committee of the Foundation for Biomedical Investigation of the Niño Jesús University Children's Hospital in Madrid. Co-IP in the CIBER of Obesity and Nutrition. Her main interests include the neuroendocrine control of metabolism and appetite, with a special emphasis on the participation of astrocytes in the physiological and pathophysiological control of metabolism and the development of comorbidities associated to obesity. Her research also includes the neuroendocrine response to specific nutrients, long-term effects of the early nutritional environment and sex differences in response to nutritional/ metabolic challenges. She has published over 200 original articles and has given lectures at the most important international meetings of endocrinology, neuroendocrinology and obesity.



Rafael de Cabo Ph.D.

Precision Nutrition And Aging Programme Programme Director /
Nutritional Interventions Research Group Leader

Rafael de Cabo, PhD is currently the chief of the Translational Gerontology Branch at the National Institute on Aging in Baltimore, Maryland. A native of Cordoba, Spain, he received his B.S. from the University of Cordoba, and his Ph.D. in 2000 from the Department of Foods and Nutrition at Purdue University. Upon completion of his graduate education, he trained as a postdoctoral fellow in the Laboratory of Neurosciences at the National Institute on Aging in Baltimore, Maryland. In 2004, he was appointed as a tenure track investigator in the Laboratory of Experimental Gerontology. His group applies both physiological and tissue-specific molecular approaches to investigate effects of nutritional interventions on basic mechanisms of aging and age-related diseases. Research within his unit strives to identify protective mechanisms invoked by caloric restriction and to evaluate the consequences of dietary interventions on lifespan, pathology, and behavioral function. Dr. de Cabo's research balances the exploration of in vivo rodent, as well as in vitro, paradigms of caloric restriction.





José María Ordovás Ph.D.

Precision Nutrition And Obesity Programme Director / Nutritional Genomics And Epigenomics Research Group Leader

Professor José M^o Ordovás is the Director of the Precision Nutrition and Obesity Program and the Principal Investigator of the Nutritional Genomics and Epigenomics Group at IMDEA Food. He is also a Professor of Nutrition and Director of the Nutrition and Genetics Laboratory at Tufts University (Boston, USA), and a Collaborating Researcher at the Spanish National Center for Cardiovascular Research (CNIC). At the Autonomous University of Madrid, he holds an Honorary Professorship in the Department of Food Sciences (Faculty of Sciences).

Professor Ordovás' research has laid the foundation for the field of Nutrigenomics, and he is considered one of the world's leading experts in this area. Early in his career, he used the candidate gene approach to describe new gene-nutrient interactions that influence the development of non-communicable diseases. As technology advanced, his studies shifted towards omics analysis (genomic and epigenomic) in large cohorts and clinical trials such as Framingham, CHARGE, GOLDN, Boston-Puerto Rican, PREDICT, PREDIMED, PESA, and CORDIOPREV.

In recent years, his work has delved deeper into the concept of biological age, exploring its significance, associated biological parameters, and how it can be modulated through lifestyle interventions. Professor Ordovás has received funding from both national (Carlos III Health Institute, Ministry of Science and Innovation) and international (ERC, NIH) public and private organizations, and has been honored with numerous prestigious science and research awards, including the International Hippocrates Research Award, the Grande Covián Award, the Gold Medal of the Spanish Society of Cardiology, and membership in the Royal Academies of Sciences, Medicine, Nutrition, and Pharmacy.

He has published over 1,400 articles in high-impact journals such as Nature, Nature Medicine, JAMA, NEJM, Circulation, and Lancet, along with several books and book chapters. His work has garnered more than 870,000 citations, with an h-index of 130 (WOS-FECYT). Additionally, his findings have resulted in three patents. Throughout his career, he has mentored numerous students and supervised more than 10 doctoral theses. He is also highly involved in scientific outreach, authoring the book "Nutrigenomics: The New Science of Wellbeing" and participating in various media events such as radio and television shows.

With over three decades of experience in Nutrigenomics and Precision Nutrition, Professor Ordovás' expertise is invaluable in advancing the field and ultimately applying it at a population level to prevent non-communicable diseases with significant societal impact.

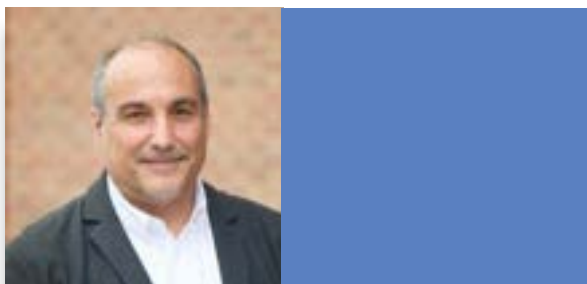


Alfredo Martínez Ph.D.

Precision Nutrition And Cardiometabolic Health Programme Director / Cardiometabolic Nutrition Research Group Leader

Prof. Alfredo J. Martínez holds a PhD Nutrition being also PharmD and MD. He is coIP and has been involved in several landmark intervention trials such as DIOGENES, SEAFoodplus, NUGENOB, FOOD4ME and PREDIMED whose results have been published in the most relevant medical and nutritional journals including NEJM, Lancet, Nature, BMJ, AJCN, Obesity, IJO, JCEM, Diabetology, Trends in Immunology, TIPS, IJO, Cell Metabolism Circulation, etc producing so far more than 20.000 citations. Prof. Martínez has supervised more than seventy PhD students and published more than 600 peer review papers in the areas of Obesity and Nutrition, including precision nutritional omics (H Factor > 60); He has been president of FESNAD and is currently president of ISNN as well as president elect of the International Union of Nutritional Sciences (IUNS) and has been recipient of several important awards including Ippocrates and Dupont prizes.

During his scientific career, Prof. Alfredo J. Martínez has enjoyed training or invited stays at Nottingham, Berkeley, MIT, Harvard, Oxford and King College London as well as being reviewer for different EU Committees and Spanish Organizations such as AECOSAN.

**Ricardo Ramos Ph.D.**

Director of IMDEA Food Institute

Ricardo Ramos Ruiz is Director of Institute IMDEA Food and directs the Institute's Nutritional Genomics and Food and Food Genomics Platform (GENYAL) at the institute. He holds a PhD in Molecular Biology from the Autonomous University of Madrid and his research work has been carried out at the at the Spanish National Research Council (CSIC) and the Scientific Research Council (CSIC) and the Autonomous Universidad Autónoma de Madrid, specialising in the mechanisms of specialising in the mechanisms of gene expression. Ricardo Ramos is one of the leading experts in experts in real-time PCR and massive sequencing and massive sequencing technologies and has been responsible for the creation and development of the Genomics Unit of the Fundación Parque Científico de Madrid, one of the most important of the Autonomous Community of Madrid. He is also a member of the executive committee of the Cluster of Innovation Technological Innovation and Talent in Biomedical Biomedical Technologies and Biotechnology of the Autonomous of Madrid (CITT Tecnologías Biomedical Technologies and Biotechnology). Ricardo Ramos is currently collaborating in teaching activities Master's degree teaching activities at the Complutense University of Madrid and other institutions as part of his scientific and scientific and educational activity.



group LEADERS



Enrique Carrillo de Santa Pau Ph.D.

Computational Biology Research Group Leader

Dr. Enrique Carrillo de Santa Pau is **Head of the Computational Biology Group at IMDEA Food Institute** and **Associate Lecture** in the Department of Biochemistry at the **Autonomous University of Madrid (UAM)**. Since 2021, he has served on the **Board of Directors of the Spanish Society of Bioinformatics and Computational Biology (SEBIBC)**. He is also a **co-founder of Microsei Biotech SL**, a spin-off of IMDEA Food, created to transform microbiome research into innovative health solutions.

Dr. Carrillo's **academic background** reflects a solid multidisciplinary foundation in life sciences, computational biology, and data analysis. He obtained his **Ph.D. in Molecular Biology (2007)** and **Bachelor's Degree in Biology (2002)** from the **Complutense University of Madrid (UCM)**. He later specialized in computational and quantitative disciplines, completing a **Master's in Bioinformatics and Computational Biology (2010)** and a **Master's in Applied Statistics (2014)**. In 2017, he earned a diploma in **Technology Transfer and Entrepreneurship** from **IE Business School**, strengthening his capacity to lead translational research and innovation initiatives.

Throughout his career, he has held positions at top research institutions, including the **Spanish National Cancer Research Center (CNIO)**, the **Nijmegen Center for Molecular Life Sciences (Radboud University, Netherlands)**, and the **Madrid Health Service**. These experiences have shaped his expertise in **genomics, epigenomics, clinical epidemiology, and computational biology**, working alongside internationally renowned scientists such as Alfonso Valencia, Francisco X. Real, Henk Stunnenberg and Miguel Ángel Salinero.

Over the years, Dr. Carrillo has participated in numerous competitive research projects funded under FP7 and H2020, including **BLUEPRINT (€30M)**, **CANCERDIP (€3.9M)**, **CANCERALIA (€4.1M)**, **ONCONET SUDOE (€2.3M)**, and the European project **FNS-Cloud (€10M)**, where he served as **Principal Investigator at IMDEA Food**. He currently **leads several major initiatives**, including **CD3DTech-CM**, a high-throughput screening platform for precision nutrition in non-responsive celiac disease, using 3D organ models and systems biology, **AI4Food-CM**, focused on artificial intelligence for personalized nutrition, and being scientific coordinator in **NUTRIClock (MSCA 2022)**, a microbiome-based framework for healthy aging. He has also contributed as a **team member** to other impactful projects such as **Gut-Finder** (Fundación Ramón Areces), **IDEAS222846DIAZ (AECC)**, and other nutritional intervention studies funded by national agencies. Additionally, he has organized and co-organized R&D activities and scientific events with institutions such as **Fundación Instituto Roche**, **IBM**, **Perkin Elmer Informatics**, **EIT Food**, and **COST Actions**, reflecting his active role in knowledge transfer and science communication.

Dr. Carrillo has authored over **50 peer-reviewed articles** in leading journals such as *Nature*, *Cell*, *Nature Communications*, *Genome Biology*, and *NAR* accumulating more than **6,500 citations** and an **h-index of 39** as of April 2025 (google scholar data). He actively contributes to international networks like, **COST Actions**, **ELIXIR Food & Nutrition community** and **EIT Food**, and supervises a growing team of postdoctoral and predoctoral researchers at IMDEA Food.



Enrique Casado Ph.D.

Clinical Oncology Research Group Leader

Head of Medical Oncology Service and Precision Oncology Laboratory, Infanta Sofia University Hospital. Dr. Enrique Casado finished his undergraduate studies in Medicine and Surgery (1992) and Biohealth Sciences (1993) in Complutense University of Madrid (Universidad Complutense de Madrid) (UCM). He obtained the Degree of Doctor of Medicine (1994) with Extraordinary Prize granted by UCM. He did his medical residency in La Paz University Hospital (Hospital Universitario de la Paz) (1993-97) and Master's Degree in Palliative Care (1997) in Universidad Autónoma de Madrid (UAM), in combination with extended postdoctoral internships in University of Alabama (Birmingham) and University of California (San Francisco). He was the attending physician of Medical Oncology in gastrointestinal and thoracic cancer and laboratory coordinator for the Translational Oncology Group of Hospital Universitario de la Paz (Madrid). He is an associate professor of UAM and visiting professor of UCM. He is currently the Director of the Medical Oncology Department at the Hospital Universitario Infanta Sofia (HUIS) de Madrid, Coordinating Professor of Oncology in the Universidad Europea de Madrid and Precision Oncology Laboratory (HUIS) Director. He has received 7 awards in recognition of his research work from institutions as prestigious as the American Society of Clinical Oncology.



Gonzalo Colmenarejo Sánchez Ph.D.

Head Of Biostatistics And Bioinformatics Unit. Senior Biostatistician

Gonzalo Colmenarejo got his PhD in the Biophysics area at Universidad Complutense de Madrid, Spain, with a thesis dealing with the design and photochemistry of nucleic acid targeted small molecules. Then he was a postdoctoral researcher in the Chemistry Department of University of California at Berkeley and Lawrence Berkeley National Laboratory, working in the Structural Biology of RNA, where he published for the first time the 3D structure and binding thermodynamics of a metal binding to the major groove of tandem G.U base-pairs in RNA. Afterwards, he spent 17 years in GlaxoSmithKline' (GSK) R&D center in Tres Cantos, Spain, working in Cheminformatics and Computational Chemistry Departments, where he gained ample expertise in the drug discovery and development process, in therapeutic areas like infectious diseases, cancer, neurodegeneration, and metabolic diseases. He applied machine learning to model molecular bioactivities and properties from molecular structure, and published the first machine learning model to predict binding affinities of small molecules to human serum albumin (HSA), a highly cited work. He also took part in multiple hit-to-lead projects, and in the analysis of ultra-high-throughput screens (uHTS) with million-sized compound collections, where he developed new methodologies to optimize the ligand efficiency of the selected compounds in screening campaigns, and to automatically extract chemical patterns from compound collections. While in GSK, he became the co-leader of the Screening Analytics group, an international team devoted to develop novel approaches for analyzing uHTS, and obtained two GSK R&D Exceptional Science Awards.

In 2017 he joined IMDEA Food as the head of the Cheminformatics and Artificial Intelligence group, where he leads a research group on generative Artificial Intelligence, Data Science, and Cheminformatics to analyze and model bioactive compounds (microbial metabolites, food compounds, animal toxins) as a source of new drugs. In the field of Foodinformatics (Cheminformatics of food compounds) his group has performed systematic analyses and predictions of the protein target space of these molecules, the interactions they establish with proteins at the atomic level, and the presence of putative aggregators and assay-interfering compounds. He has also collaborated with an international team that validated a new malaria target (PfCLK3) with multi-stage and multi-species capability, in a highly cited work published in Science. In the field of gut microbial metabolites, his group has analyzed and modeled the physicochemical and biodistribution properties of these molecules, and systematically analyzed and predicted their host and bacterial target space. Their latest work is focused on the comprehensive analysis of the interactions these molecules establish with their protein targets, and the use of this data to train novel generative AI models to design inhibitors based on these molecules.

He is so far (co)author of 79 scientific publications in peer-reviewed journals and book chapters, in high impact journals like Science, Science Advances, Nature Communications, Journal of Chemical Information and Modeling, Journal of Cheminformatics, etc.



Lidia Daimiel Ruiz Ph.D.

Nutritional Control Of The Epigenome Research Group Leader

Lidia Daimiel holds a PhD in Cell Biology and Genetics from the Autonomous University of Madrid and is Principal Investigator of the Nutritional Control of the Epigenome Group at IMDEA Alimentación. Her research lies at the intersection of nutrigenomics and epigenetics, focusing on how dietary components influence gene expression and epigenetic mechanisms related to cardiometabolic diseases and aging.

Her pioneering work has explored the regulatory role of cholesterol, fatty acids, and TMAO on microRNA expression, as well as the impact of specific foods—including beer, extra virgin olive oil, the Mediterranean diet, and ultra-processed foods—on DNA methylation and microRNA profiles. In addition, she has led nutritional epidemiology studies analyzing the association between nutrient intake (e.g., choline, betaine, polyamines) and markers of cardiometabolic, liver, and kidney health.

She is Principal Investigator of the nationally recognized PREDIMED-Plus and ENSATI studies. Her research has resulted in over 150 publications in high-impact journals such as JAMA, Diabetes Care, EMBO Molecular Medicine, and AJCN, accumulating over 3,000 citations with an h-index of 31.

Dr. Lidia Daimiel maintains active collaborations with national and international research networks, including CIBERobn, GeroScience Task Force, STRENGTH, EIT-Food Healthy Aging Think and Do Tank, AtheroNET COST, and SENESENCE2030 COST. She has received competitive funding from national agencies like the Instituto de Salud Carlos III and the Ministry of Innovation and Science, as well as European programs such as EIT-Food and ERA-HDHL.

A respected evaluator, she serves on expert panels for the State Research Agency, COST, and the Science Fund of the Republic of Serbia. She is a member of the American Society of Nutrition, the Spanish Society of Nutrition, and the Spanish Society of Atherosclerosis.

Dr. Lidia Daimiel also plays a key role in academic training and outreach. As an associate professor at CEU San Pablo University, she has supervised over 15 undergraduate and master's theses and mentors multiple PhD candidates. She actively contributes to scientific dissemination through media appearances, articles in The Conversation, and the development of educational materials.

She leads translational efforts in AI-driven nutrition, currently protecting an algorithm for glucotype characterization selected by DeepTech Madrid. As CEO of Food-iSense Analytics, she engages in the entrepreneurial ecosystem, contributing to regional and national innovation platforms.



Alberto Dávalos Ph.D.

Epigenetics Of Lipid Metabolism Research Group Leader

Dr. Alberto Dávalos holds a degree in Pharmacy and Biochemistry by San Marcos University (Lima) and a PhD in Pharmacy by Universidad Complutense de Madrid (Madrid). He has conducted postdoctoral research at the Hospital Ramón y Cajal (Madrid), at Yale University School of Medicine (New Haven), and at New York University School of Medicine (New York). Dr. Dávalos's research program focuses in identifying and characterizing new noncoding RNAs (miRNAs, lncRNAs and other type of regulatory RNAs) that regulate lipid metabolism and the effects of minor dietary components (micronutrients) on their expression.

Dr. Dávalos has developed an active research program in the last 10 years leading the "Laboratory of Epigenetics of Lipid Metabolism" at IMDEA Food Institute (Madrid).

His major scientific contributions can be summarized in five topics.

- I) The role of microRNAs in lipid metabolism.
- II) The regulation of tissue miRNAs and DNA methylation by both dietary components and diet
- III) The regulation of circulating miRNAs by physical activity and the use of circulating miRNAs as biomarkers of disease.
- IV) The regulation of circulating miRNAs by physical activity and the use of circulating miRNAs as biomarkers of disease.
- V) The use of extracellular vesicles (EVs) for miRNA-based therapy and dietary exogenous miRNAs

The following scientific-related indicators from his research career includes (Scopus): h-index 46; total cites 9946, per year around 900 (in the last 5 y); 138 JCR peer-reviewed articles (52, last 5 y); total publications in first quartile (Q1) 95%, in first decile (D1): 20%



Alberto Díaz-Ruiz Ph.D.

Cellular And Molecular Gerontology Research Group Leader

I am a M. Sc. Veterinary Medicine specialized in the fields of Metabolism, Aging and Cancer. Awarded with Ramon y Cajal Program (2021), and previously with Talent Program (2018, Madrid), I am since 2024 a permanent Group Leader of the Laboratory of Cellular and Molecular Gerontology (CMG) within the Precision Nutrition and Aging Branch at IMDEA Food Institute, Madrid. In the last 5 years, I have raised funds as Principal Investigator [~1,1M€] from private entities and highly competitive calls. I have also participated in 6 projects as Research-Member [>1M€] and I have secured funds for research personnel, including a Predoctoral positions, a Sara Borrell Post-Doctoral and a Margarita Salas Post-Doctoral position. I have co-authored 50 peer-reviewed articles [80% in Q1, h index 25] and received research-awards at every stage of my scientific career [Total of 8, also R3]. With 19 yrs of experience, I have carried out multiple research periods in recognized R&D centers: i) Univ. of Cordoba, PhD in Sciences (2011); ii) Center for Basic Neuroscience [Univ. of Dallas, 6mo] and the Department of Molecular and Cellular Physiology [Stanford Univ. School of Medicine, 4mo], supervised by Dr. Thomas C. Sudhof [2013-Nobel Prize in Medicine]; iii) IMIBIC [2yrs postdoc], supervised by Dra. María del Mar Malagón; iv) National Institute on Aging (NIA, USA, 4yrs postdoc), supervised by Dr. Rafael de Cabo; and v) Univ. of Illinois at Chicago (Division of Endocrinology, Diabetes and Metabolism, 2mo). I am also accredited as 'Profesor Contratado Doctor' by ANECA and I am a Permanent Guest Professor and/or Course Coordinator at >7 Masters/Universities (UAM, UCM, UV, CEU, UNIR, UIV, UCO/IMIBIC, UE). In addition, I am a Co-founder and Scientific Advisor of Microsei Biotech SL, a spinoff from IMDEA Food.



María Isabel Espinosa Ph.D.

Head of the Nutritional Genomics and Health Unit. Senior Nutritionist

Isabel Espinosa Salinas holds PhD in Biology and Food Sciences, a Human Nutrition and Diet degree and a Food Science and Technology degree, by Universidad Autónoma de Madrid. She has been involved in Endocrinology and Nutrition Department of "La Paz" and "Puerta de Hierro" Hospitals. She collaborated with Mahou-San Miguel Group for the development of a health and nutrition program in several cities around Spain. In 2010, she joined IMDEA Food and worked on the set up and development of the Platform for Clinical Trials in Nutrition and Health GENYAL. At present, she has more than seven years of experience as nutritionist in the development of more than 15 clinical trials funded by National Projects grantee and in nutritional intervention studies for companies as Biosearch Life or Capsa Food among others. She has teaching experience in nutrition courses and workshops. She has co-authored several publications, classroom books for Fundación Universitaria Iberoamericana and she has also presented different communications in national and international congresses.





Jaime Feliú Ph.D.

Clinical Oncology Research Group Leader

Head of Medical Oncology Service, La Paz University Hospital. Dr. Jaime Feliú Battle holds a Degree in Medicine and Surgery from Universidad Complutense de Madrid issued in 1982. He specialized in Medical Oncology in Hospital Universitario de la Paz, where he is currently the Director of Medical Oncology Department. He is a professor of Oncology in the Medicine Area of Universidad Autónoma de Madrid (UAM) and Director of Master's Degree in Palliative Care and Treatments for Cancer Patient Support of UAM. Furthermore, he is the current president of the Multidisciplinary Spanish Group of Digestive Cancer (GEMCAD). He has participated as a principal investigator or co-investigator in more than 70 phase I, II and III trials. He has written or co-written more than 200 articles for national and international journals, more than 60 book chapters and has presented a large number of communications in national and international congresses.



Maria Ikonopoulou Ph.D.

Head Of Transactional Venomics Research Line

Dr. Maria Ikonopoulou, PhD is the Principal Investigator of the Translational Venomics Group at the IMDEA-Food Institute in Spain and an Honorary Associate Professor at the University of Queensland, Australia. With over 15 years of international experience in biology and biotechnology, she has established a strong track record in innovation, collaboration, and translational venom-based research.

Dr. Ikonopoulou's research focuses on the biodiscovery of venom-derived compounds for applications in ageing and ageing-related diseases. She integrates advanced techniques, including multi-omics, molecular biology, toxicology, pharmacology, and ecological methods, to uncover mechanistic insights into venom-derived compounds, emphasizing their biotechnological applications.

She has authored numerous papers in high-impact journals such as *Nature Communications*, *Cell Reports*, and the *British Journal of Pharmacology*. Her work has been highlighted by Faculty F1000 and featured in major media outlets. Her research contributions include a European patent and a Patent Cooperation Treaty (PCT) application for venom-based senolytic and senomorphic agents, underscoring the translational impact of her group's research.

Dr. Ikonopoulou has secured over €1.5 million in competitive international and national research funding as lead investigator. Her collaborations span the globe, with approximately 85% of her publications involving international co-authors, reflecting her robust global network. She is a dedicated mentor to over 20 early career researchers and is actively involved in capacity-building initiatives.

She serves on the Core Management Committee of the European Venom Network (EUVEN) COST ACTION as Stakeholder Engagement Leader and as a board member of the European Section of the International Society of Toxinology. In addition to her current roles, Dr. Ikonopoulou is an On Deck Longevity Biotech Fellow, supporting revolutionary longevity biotechnology startups. She is also a supporter of STEMM WOMEN in Australia and Spain, reflecting her commitment to advancing women in science. Dr. Ikonopoulou has received 15 international awards, including recognition in health innovation competitions and entrepreneurship programs.

She returned to Europe in 2017 as a "Marie Curie" AMAROUT Fellow to lead the "Translational Venomics" Project. Consequently, she was awarded a Senior Research TALENTO Fellowship by the Madrid Government to establish her research. Dr. Ikonopoulou holds a BSc (Hons) in Agricultural Technology from the Technological Educational Institute in Western Macedonia, Greece, with part of her degree conducted at the Teagasc-Moorepark Research Centre in Ireland. She earned her MSc in Zoology from the University of Tasmania and her PhD in Biomedical Sciences from the University of Queensland, Australia. She has held postdoctoral positions at the University of Queensland and QIMR Berghofer in Australia.



**Moisés Laparra Ph.D.**

Molecular Immunonutrition Research Group Leader

José Moisés Laparra Llopis holds a PhD in Pharmacy gained during his stay at the High Research Council of the Spanish Government. His scientific career is focused on the field of intestinal homeostasis and the crosstalk within gut-liver axis. The novelty and scientific and social impact of his studies was used by the European Food Safety Authority to establish recommendations concerning staple foods. A continuous contact and interaction with internationally renowned research groups constitutes a constant in Dr. Laparra's career. He held a leading position on prebiotic research awarded by The Fulbright Commission to conduct postdoctoral research in the Food Science Department at Cornell University.

Additionally, he participated in teaching activities that end up in a renowned honor thesis awarded by the professional organization for food science and technology professionals in the U.S. This experience favored his incorporation to the Institute of Translational Immunology at the University Medical Center of Mainz University as independent researcher. Dr. Laparra has published over 70 scientific articles and book chapters.

He has overseen several precompetitive public funded projects. As senior researcher at IMDEA Food he develops immunonutritional-based precision strategies to tumor suppression.

**Cristina Ramírez Ph.D.**

Posttranscriptional Regulation Of Metabolic Diseases Research Group Leader

Ph.D. in Molecular Biology and Cellular. Her work is focused in the Molecular Basis of the of metabolic and age-related diseases, in which the novel role of miRNAs and other post-transcriptional regulators remains incomplete. Her work in this area has demonstrated the contribution of miRNAs and RNA Binding Proteins (RBPs) to hepatic lipoprotein production, HDL modulation, hepatic metabolism and glucose homeostasis, etc. Aging, which characterizes by the loss of physiological integrity, represent the main risk factor for major human metabolic diseases. In this line, an important component of our research interest rely on uncovering the novel role of posttranscriptional networks, with special interest in the posttranscriptional pair composed of hnRNPK/miR-7, and their potential use for diagnosis and future therapies.





Fernando Rodríguez Artalejo Ph.D.

Cardiovascular And Nutritional Epidemiology Research Group Leader

Fernando Rodríguez Artalejo, MD, PhD, is Professor of Preventive Medicine and Public Health at the Medical School of the Universidad Autónoma de Madrid and Scientific Director of the Biomedical Research Networking Center in Epidemiology & Public Health (CIBERESP). Dr. Rodríguez Artalejo graduated from the Universidad Autónoma de Madrid and received postgraduate training in the La Paz University Hospital, the Institute of Health Carlos III and the Spanish Ministry of Health in Madrid, as well as in the London School of Hygiene and Tropical Medicine and the Johns Hopkins Bloomberg of Public Health in Baltimore. He has published over 750 scientific articles in peer-reviewed journals (h-index in WOS: 83) and contributed to many policy documents on health planning and evaluation and on prevention and control of obesity and cardiovascular disease. He has received the Carles Martí Henneberg award to a scientific career on Nutrition Research, the Ciril Rozman award of the Spanish Society of Internal Medicine, the Silver Medal of the National Plan on Drug Addiction, and the Encomienda de la Orden Civil de Sanidad. Dr. Rodríguez Artalejo has been a member of the Scientific Committee of the Spanish Agency of Foods Safety and Nutrition, the European Advisory Committee of Health Research of the World Health Organization, and the Expert Panel of the European Joint Action on Prevention of Frailty (ADVANTAGE).



Francesco Visioli Ph.D.

Bioactive Ingredients Food Research Group Leader

Francesco Visioli earned a degree in Pharmacy and Pharmaceutical Chemistry from the University of Milan and a PhD in Biotechnology from the University of Brescia (based on work performed at the Louisiana State University Neuroscience Center). After being Full Professor of physiopathology at the Université Paris 6 "Pierre et Marie Curie", where he directed the "Micronutrients and cardiovascular disease" unit, he is now Professor of human nutrition at the University of Padua, Italy and Senior Investigator at the Madrid Institute for Advanced Studies (IMDEA)-Food. Formerly involved in neurochemistry, Dr. Visioli's research currently concerns essential fatty acids, namely those of the omega 3 series, and natural antioxidants, as related to atherosclerosis and cardiovascular disease. In particular, Dr. Visioli's group discovered the biological and pharmacological properties of olive oil phenolics, including hydroxytyrosol. In addition, Dr. Visioli is being studying some bioactive components of plant foods, including lycopene from tomato and biophenols from wild greens. His research ranges from in vitro studies of bioactivity (test tubes, cell cultures) to in vivo tests, performed on laboratory animals and/or humans. Dr Visioli has a publication record of approximately 250 papers and book chapters, which have been cited over 10,000 times.



LAB technicians



Susana Molina Ph.D.

Lab Manager and Technical Responsible of the Genomic Laboratory

Susana Molina Arranz, performed her PhD studies in the group of Prof. Luis Carrasco at the "Centro de Biología Molecular Severo Ochoa" (CSIC-UAM). In 2007 she joined Dr. Juan M. Torres group at "Centro de Investigación en Salud Animal" (INIA), a research group about prion diseases and its strain barriers. Between 2008 and 2009 she joined the group of Fernando Valdivieso at the "Centro de Biología Molecular Severo Ochoa" (CSIC-UAM), working as a technician generating biological tools for the therapeutic investigation of Alzheimer Disease. During all these years she acquired experience in cell culture, as well as different techniques in molecular biology as western blotting, cloning, and nucleic acid and protein purifications. In 2009 started in IMDEA Food as the Technical responsible of the Genomic Laboratory, working both in the investigation line about nutritional genomics of cancer, as well as in GENIAL Nutrigenomic Laboratory. Her work in the GENIAL Platform includes processing and analyzing samples from the different intervention studies that are developing in IMDEA Food, but also from external companies and research centers interested in genotyping studies.



Carmen Crespo Ph.D.

Technician Doctor of the Laboratory

M^a del Carmen Crespo Lorenzo has a first degree in Molecular and Cellular Biology from the IE University of Segovia (2010). In 2013 she obtained a master's degree in Pharmacological Research from the Universidad Autónoma de Madrid (UAM). As part of her research activity, she joined the research project team "Genetic and genomic analysis in patients affected by Gorham-Stout Disease and General Lymphatic Anomalies" at the Hospital Universitario La Paz (Supervisor: Dr. Pablo Lapunzina). In June 2014, she started her Ph.D. program at IMDEA's Bioactive Ingredients Food Group (Supervisors: Prof. Francesco Visioli and Dr. Alberto Dávalos). Her thesis is focused on the protective function of specific micronutrients (soy isoflavones, hydroxytyrosol, and bioactive polar lipids) performing in vitro, in vivo and placebo-controlled, randomized trials in healthy volunteers to evaluate the possible beneficial effect that these molecules play on cardiovascular and neurodegenerative diseases. In March of 2018, she obtained a doctoral degree, marked outstanding, Cum Laude. The title of the doctoral thesis is: "Protective function of specific micronutrients against cardiovascular and neurodegenerative diseases".



Mónica Gómez

Biosafety and Occupational Risk Prevention Manager. Senior Lab Technician

Monica Gómez Patiño is Expert in Biosafety in laboratories and is a Senior Lab Technician. Specialist in Chemical and Microbiological Analysis. In addition, she holds a certificate of higher education in Instrumental Analysis Techniques. She has professional experience in the field of pharmaceuticals working in private companies gaining experience in the field of biochemistry by applying a wide range of techniques to identify, quantify and detect specific proteins. Moreover, she worked in Public Research Organizations such as INIA, CIB-CSIC acquiring wide experience in Chromatographic techniques and in Genomic and Molecular biology area. Now, in IMDEA Food Institute, she is the Head of the Biosecurity and Biohazardous, Chemical and Cytotoxic waste Management and supports the management of the laboratories. She is also responsible of the Biosafety Laboratory Level P2, processes and manages the international Import and Export of biological samples and is in charge of managing the official accreditations and permits for the laboratories and she is the Responsible of the Occupational Risks Prevention.



José Luis López

Lab Technician

José Luis López is a highly qualified technician with over eight years of experience in managing mouse colonies and conducting a wide range of experimental techniques in murine models. He previously worked in the Comparative Medicine Unit at the National Center for Cardiovascular Research (CNIC) in Madrid. Currently, José Luis is responsible for all mouse experiments at IMDEA-Food Institute. He coordinates the mouse colonies housed in various animal facilities (CNB, CNIO, UAM, URJC) in Madrid, carrying out specific experiments and implementing different techniques. He also supports various lines of research using molecular and cell biology techniques.



Miguel Ángel Muñoz Pliego

Lab Technician

He was graduated as a Higher Technician in Clinical and Biomedical Laboratory, at CIFP N° 1 of Toledo, achieving first class honors in June 2024. His professional journey began at the Membrane Biology and Axonal Repair Laboratory at the National Hospital of Paraplegics, where he worked as a technician, gaining valuable experience in the investigation field. In March 2025, joins the Molecular Immunonutrition group at IMDEA Food, where he is working as a Laboratory Technician



researchers



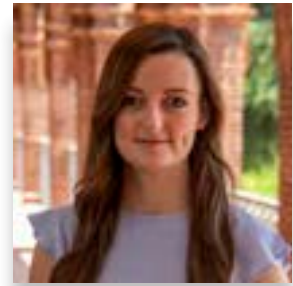
**Amanda Cuevas Sierra
Ph.D.**

She was graduated in Biology and master's degree in Food, Nutrition and Metabolism. From 2017 to 2021 she carried out her PhD project focusing on gut microbiota and obesity and defending on December 2021 (Extraordinary Award Thesis). Her investigations dealt with gut microbiota differences between subject with obesity and normal weight, host interactions between gut microbiota and genetic background, the effects of dietary components on gut microbiota compositions, the study of changes in gut microbiome composition and functions after a weight loss intervention and searching metagenomic biomarkers to personalize the prescription of weight loss diets according to gut microbiota composition. Her investigations (29 publications) have obtained more than 1000 cites. Moreover, she did two stays in Weizmann Institute of Science (Israel) where she participated in projects on modulation of gut microbiota, and in Nova Medical School of Lisbon (Portugal). She joined IMDEA in April 2022 as postdoctoral researcher in Precision Nutrition and Cardiometabolic Health group lead by Prof. Alfredo Martínez. Currently, she holds a postdoctoral Sara Borrell grant.



**Begoña de Cuevillas
Ph.D.**

Throughout her academic career, she has earned a Bachelor's degree in Human Nutrition and Dietetics from the Complutense University of Madrid (UCM) and a Master's degree in Food, Nutrition, and Metabolism from the University of Navarra (UNAV). She completed her doctoral research at the Nutrition Research Center of UNAV under a predoctoral contract, focusing on the analysis of risk factors associated with obesity and its comorbidities—including dietary and sleep patterns, physical activity, gut microbiota, and quality of life—in both pediatric and adult populations. Her work aimed to contribute to the development of more effective and personalized treatment strategies. She is currently a postdoctoral researcher at IMDEA Nutrition. Her publication record reflects strong scientific impact, with 14.3% of her papers involving international collaboration, 28.6% ranking in the highest global citation percentile, and 42.9% published in top-quartile journals by CiteScore. Her average Field-Weighted Citation Impact (FWCI) is 0.88. Notably, she has published eight articles on obesity, microbiota, and health, collectively cited over 35 times. Her involvement in projects such as the Childhood Obesity Risk Assessment Longitudinal Study (CORALS) and METAINFLAMACIÓN-CM underscores her commitment to translational research aimed at addressing urgent public health priorities and improving population health outcomes.



**Cristina María Fernández
Ph.D.**

Cristina M^a Fernández Díaz obtained her PhD in Biomedical Research from the University of Valladolid and the Institute of Biology and Molecular Genetics (IBGM) in 2019. She also holds a degree in Human Nutrition and Dietetics and two master's degrees in Biomedical Research and Nutrition. Her thesis focused on the targeting of proteolytic enzymes in the course of diabetes mellitus and other metabolic diseases. In 2018 she was awarded with an European Molecular Biology Organization (EMBO) Short-Term Fellowship to learn new metabolic analysis techniques at the Oxford Center for Diabetes, Endocrinology and Metabolism, University of Oxford (Oxford, UK) under the supervision of Dr. Patrik Rorsman. She has published several peer-review manuscripts in high impact international journals in the area of metabolism and nutrition. In June 2020 she joined the Molecular Oncology and Nutritional Genomics of Cancer Group (Precision Nutrition and Cancer) at IMDEA Food Institute, where she focuses her research on the study of metabolic alterations in chronic diseases such as obesity and cancer. Additionally, she explores gene-nutrient interactions applied to the prevention of pathologies and health promotion.



**Lara Fernández Álvarez
Ph.D.**

Lara P. Fernández Álvarez obtained her PhD in Biochemistry, Molecular Biology and Biomedicine from the Autonomous University of Madrid (UAM) and the Spanish National Cancer Research Centre (CNIO), Spain, in 2009. Her thesis focused on the characterization of genetic susceptibility to malignant melanoma. Since 2010, she has conducted postdoctoral research at the Molecular and Cell Biology of the Thyroid group in the Biomedical Research Institute (IIBm-CSIC-UAM), in Madrid. In December 2014 she joined IMDEA Molecular Oncology Cancer Group where her research is focused on the study of genetic biomarkers of cancer and obesity risk, clinical assays, precision nutrition and precision medicine, molecular prognostic factors and resistance to treatment. She has a solid and multidisciplinary professional experience in Precision Nutrition, Human Genetics, Molecular Endocrinology, Cancer biology, Cancer Susceptibility and Oncology. Additionally, she has published more than thirty research articles in international journals.



**Edwin Fernández Cruz
Ph.D.**

Edwin Fernández received his doctorate in 2018 from the University of Seville, specializing in the analysis of bioactive compounds. Between 2019 and 2022, he carried out research work related to the design of clinical trials of nutritional intervention at the Food, Nutrition and Health Platform of the La Paz University Hospital in Madrid. In addition, he has carried out numerous teaching collaborations with the International University of La Rioja (UNIR), being director and academic coordinator of an Official Master's Degree and with the CUNIMAD higher education center. Between 2022 and 2023 he acquired a position as Associate Professor in the Department of Biomedical Sciences of the Alcala de Henares University. Currently, he works in the Precision Nutrition and Cardiometabolic Health group, led by Dr. Alfredo Martínez, on projects related to the characterization of biomarkers of dietary intake. Additionally, the group actively hosts Master's students from various Spanish and international universities, fostering training and collaboration across academic institutions.



**María García-Beccaria
Ph.D.**

María García-Beccaria is a bioinformatician and biostatistician at IMDEA Food Institute since December 2023, supporting the Platform for Clinical Trials in Nutrition and Health (GENYAL) and all IMDEA research groups. Her daily work involves the analysis of omics data—including microbiota, RNA sequencing, and methylation—as well as routine descriptive statistics, correlation studies and more advanced statistical methods such as predictive modelling using clustering, regression, and neural networks, with a personalized medicine approach. With over a decade of experience in molecular biology research, María has participated in projects related to cancer, aging, metabolism, and the immune system. She holds a Biology degree from Complutense University of Madrid and a PhD in Molecular Biology carried at the CNIO, where she studied telomere-based new potential lung cancer therapies and aging mechanisms. Her postdoctoral work at DKFZ in Heidelberg focused on bile acid metabolism and immunomodulation properties in liver tumors. María specialised in Biostatistics and Bioinformatics with an MD, collaborated in a research project at the IIS (Instituto de Investigación sanitaria de Aragón), aimed at identifying with bioinformatic tools cancer neoantigens that could be used to develop cancer vaccines. She also worked in a company as a health-care data scientist, with the ultimate goal of enhancing medical practice and processes.



**César Gómez Raposo
Ph.D.**

César Gómez Raposo obtained his Medicine Degree at Universidad Autónoma de Madrid in 2002 and later his Medical Oncology speciality at Hospital Universitario La Paz in 2007. He performed his doctoral thesis (Excellent Cum Laude) in 2012 focused on ovarian cancer. Since 2008 he worked as medical oncologist at Hospital Universitario Infanta Sofía in San Sebastián de los Reyes, mainly in breast and gynecological cancer. As a result of this activity has participated in more than 25 papers published in peer reviewed medical or scientific journals and has taken part in international clinical trials in breast and gynecological cancer. Currently, her line of research focuses on breast cancer and gynecological cancer and leads several clinical trials that relate diet with prognostic and predictive factors of response to cancer treatment.



Pilar Guallar
Ph.D.

Pilar Guallar Castillón, MD, PhD, Senior researcher and Head of Research Line in the influence of diet on the development of cardiometabolic diseases. She is Professor of Preventive Medicine and Public Health at the Universidad Autónoma de Madrid. An specialist in Preventive Medicine and Public Health via MIR (La Paz Hospital). Has spent more than 20 years teaching Public Health by participating in graduate and postgraduate programs. She is also responsible for courses on nutritional epidemiology. Her research activity has focused on the study of healthy behaviours and habits (HBH) especially in the field of cardiovascular and nutritional epidemiology. The author of more than 200 publications that are mainly in the first quartile of impact factor in their categories. Currently interested in the influence of cooking methods and chronobiology in the process of suffering from cardiometabolic diseases. Research collaborator in IMDEA Food Institute.



Lourdes Herrera-Quintana
Ph.D.

Dr. Herrera-Quintana graduated in Pharmacy and in Human Nutrition and Dietetics, with a master's degree in human nutrition and a PhD in Human Nutrition and Food Sciences. She obtained a predoctoral FPU Grant/contract (Spanish Ministry of Education) and carried out international research stays/mobilities for a length of 8 months, at Mendel University (Brno, Czech Republic) and University of Florida (Gainesville, USA). She has participated in national and international courses, congresses, and dissemination activities. She has co-authored more than 30 publications in indexed journals, collaborating in different research lines mainly focused on the risk of malnutrition and related disorders. Currently, she has joined the Cellular and Molecular Gerontology Lab (Precision Nutrition and Aging group) at IMDEA Food Institute as a postdoctoral researcher.



Pablo Iturbe Sanz
Ph.D.

Pablo Iturbe Sanz obtained his bachelor's degree in Biology with a specialization in Biotechnology at the Complutense University of Madrid in 2016. He then pursued a master's degree in Molecular and Cellular Biology at the International Menéndez Pelayo University-CSIC, which he completed in 2018. After that, he was awarded with a contract to work in the Environmental Microbiology group, under the supervision of Dr. Eduardo Díaz at CIB-CSIC (Madrid). In 2019 he moved to Pamplona (Navarra, Spain), to start his PhD in Biotechnology at the Public University of Navarra (UPNA), funded by an FPI fellowship from the Spanish Ministry of Science, Innovation, and Universities. His doctoral research in the Microbial Pathogenesis group at Navarrabiomed-UPNA, under the supervision of Dr. Iñigo Lasa, focused on the study of clinically relevant bacteria *Staphylococcus aureus*, and involved transcriptomics, bioinformatics, and molecular biology approaches. With a strong background in microbiology, molecular biology, and cellular biology, his career has been dedicated to understand microbial systems and their interactions with the host. Since 2024, he has been a postdoctoral researcher at the IMDEA Food Institute in the Molecular and Cellular Gerontology group. His current research focuses on the role of gut microbiota in aging and its implications for precision nutrition. Alongside his research, he has also been involved in teaching, serving at CEU San Pablo University and the Public University of Navarra.



Ana María Jiménez Gordo
Ph.D.

Graduated in Surgery and Medicine at Universidad Autónoma Madrid (1994). Specialty in Medical Oncology at Hospital Universitario La Paz (1998). PhD in Medicine at Universidad Autónoma Madrid (2004). Master in Palliative Care of Neoplastic Patient at Hospital La Paz (1998). Master's in molecular Oncology at CNIO (2009). Associate Profesor in Oncology at Universidad Europea Madrid from 2013. She has worked as Medical Oncologist in Hospital La Paz (1990-2000), Hospital Alcorcón (2000-2005), Hospital Getafe (2005-2013) and Hospital Infanta Sofía from 2013. Pfeizer Foundation Prize of Clinical Investigation in 2012. She has more than 80 national and international publications, congress communications and book chapters. She is member of Spanish Society of Clinical Oncology and has collaborated in several work groups of lung cancer survivors, translational investigation, geriatric Oncology and doing some Clinical Guidelines. Currently his line of research focuses on colorectal cancer and collaborates in several clinical trials promoted by IMDEA Food.



**Marta Gómez de Cedrón
Ph.D.**

Ph.D. in Biology and Molecular Genetics from the Autonomous University of Madrid (UAM) in 2004. She has built a distinguished career in the fields of metabolism, nutrition, and non-communicable chronic diseases, including cancer. In 2013, she joined the IMDEA Food Institute to apply molecular nutrition to improve overall health and treatment responses for chronic non-communicable diseases. She leads the Metabolism and Metabolic Reprogramming Unit at IMDEA Food, focusing her research on cellular metabolism and metabolites involved in pathophysiological processes. Gómez de Cedrón is a national and international expert on the study of metabolism and cellular bioenergetics. She has been invited to speak at numerous expert forums and has published extensively with leading research groups in the field. With over 50 scientific publications, including book chapters, she has mentored more than 20 students (undergraduate, master's, internships), supervised one doctoral thesis, three master's theses, and five undergraduate theses, and participated in thesis defence committees. She has been part of the research team in nearly 20 national and international projects, with over 25 presentations at national and international conferences.



**María-Carmen López
de las Hazas Ph.D.**

My research focuses on evaluating the influence of lifestyle and dietary components on the epigenome through the modulation of circulating miRNAs and DNA Methylation. I also study the potential use of extracellular vesicles (EVs) as biomarkers of diseases and investigate their potential use as delivery vehicle for developing new therapeutic strategies. I developed my scientific career in 8 research centers. I have published 51 peer-reviewed papers (Scopus); Citations: 1410; First author= 27; first quartile (Q1): 48; first decile (D1): 21; h-index= 22. And participate in more than 20 congresses. Extraordinary Doctorate Award. Competitive grants: Ramon y Cajal (RYC2022-002906-C), Juan de la Cierva I. (IJC2020-044353). Leader (PI) of 3 competitive projects. Main research lines:
A) Study the epigenetic effects of dietary compounds
B) Use of EVs as emerging vehicle for drug delivery and biomarkers of disease
C) Study the influence of micro and nanoplastics on the epigenome
Other cutting-edge research interests: Incorporate epigenetic information into Personalized/ Precision Nutrition using ncRNAs to predict or treat diseases (and incorporate epitranscriptomic data to nutrition research.



**Esther López-García
Ph.D.**

Esther Lopez-Garcia, PhD, MPH, Mh-Pharm is an Associate Professor of Epidemiology at the Department of Preventive Medicine and Public Health, in the Universidad Autónoma de Madrid. She has been a Fulbright fellow in the Department of Nutrition at the Harvard T. Chan School of Public Health and a Ramón y Cajal researcher at the Universidad Autónoma de Madrid.

Dr Lopez-Garcia research interests include:

- Epidemiology and prevention of obesity and cardiovascular disease through diet and lifestyle.
- Diet and the risk of physical function impairment, frailty and disability in the older population.
- Metabolomics in frailty and disability.

Dr Lopez-Garcia has assessed in detail the effect of the Mediterranean dietary patterns, coffee, meat and dairy consumption, in the risk of CVD and disability, using data from large population studies in the USA, UK and Spain. She has also examined the biological mechanisms that may explain these associations, including inflammation and endothelial dysfunction, markers of glucose metabolism and leptin, and more recently metabolomics profiles of physical impairment and functional disability.



**Laura J. Marcos
Zambrano Ph.D.**

Dr. Laura Marcos-Zambrano is a bioanalyst specializing in metagenomics, bioinformatics, and clinical microbiology. She leads the host-microbiome interactions research line at the IMDEA Food Institute and is an Associate Professor at Alfonso X el Sabio University. Her research focuses on gut microbiome disruption in diet-related diseases, with 45 indexed publications, an h-index of 20, and extensive experience supervising students and researchers. Dr. Marcos-Zambrano holds a degree in Bioanalysis from the Central University of Venezuela (Academic Excellence Award, 2010) and a Master's in Therapeutic Targets and Cell Signaling from the University of Alcalá (2012). She earned her PhD in Microbiology at the Complutense University of Madrid in 2017 (Cum Laude and Extraordinary Doctorate Award), supported by a fellowship from the Instituto de Salud Carlos III (FI12/00265). She later obtained a Juan de la Cierva Incorporación Grant (IJC2019-042188-I) to join IMDEA Food. She has contributed to 12 competitive research projects, acting as Principal Investigator in three, including a Young Researcher Grant from ESCMID (€20,000), a Proof of Concept project funded by EIT Food (€50,000), and the ongoing GutPlantHealth project (PID2023-1501460A-I00; €158,750). She actively promotes gender equality through initiatives such as 11Febrero and events like "Ciencia x Mujeres," Madrid Science Week, and Researchers' Night. She has also contributed to public outreach through the development of the gut microbiome game #Bichindario, press releases, and radio interviews.



Adrián Martín Segura Ph.D.

Adrián Martín developed his PhD in neuronal aging at the Centro de Biología Molecular Severo Ochoa (CBMSO, Madrid) in 2017. Then, he did a postdoctoral stay at the Albert Einstein College of Medicine in New York, working in the relationship of autophagy with aging and Parkinson's disease. He joined IMDEA Nutrition in 2023, focusing in the influence of microbiome on metabolism and aging. His research uses bioinformatic and artificial intelligence approaches to understand how alterations in this relationship can lead to disease onset, in particular of neurodegenerative disorders. Also, to comprehend how our nutrition, through its connection with metabolism and microbiome, can modulate a healthy development of aging or favor its turn into disease. The idea is first to understand better those interconnected processes. Then, to develop predictive tools for those conditions that could facilitate and early identification of symptoms and prevent disease progression. Finally, to design nutritional interventions to influence on these mechanisms and promote the development of a healthy aging.



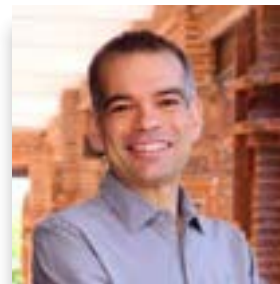
David Martínez Ph.D.

PhD, is Tenured Associate Professor of Preventive Medicine and Public Health at the Universidad Autónoma de Madrid. He graduated in Physical Education (2004) and Sports Sciences (2006) in the Universidad Autónoma de Madrid, and then he completed a PhD thesis in Sport Sciences (2011) when joined to the Institute of Food Science, Technology and Nutrition in the Spanish National Research Council. After the PhD, a MSc specialization in Epidemiology was obtained and a postdoc training was done in the Departments of Preventive Medicine and Public Health, and Physical Education, Sport and Human Movement in the Universidad Autónoma de Madrid. He has got national major research grants from the Spanish research career during his undergraduate, predoctoral and postdoctoral periods. He has stays at Iowa State University (USA), Karolinska Institutet (Sweden), Michigan State University (USA), WHO Center for Epidemiological Research (Brazil), Research Center in Physical Activity, Health and Leisure (Portugal) and the Geriatric Epidemiology Unit in the Health Tuscany Center (Italy). David has published 4 books, 5 chapters of books, and more than 200 scientific JCR articles (H-index =59). Dr Martínez- Gomez research interests are related to physical activity epidemiology, including: 1) assessment and monitoring of physical activity in clinic and epidemiological studies; 2) determining the role of physical activity on health outcomes, especially obesity, cardiovascular disease and mortality; and 3) promotion of physical activity across the life span.



Javier Moral Sanz Ph.D.

Dr. Moral-Sanz received his bachelor's in pharmacy from the University Complutense of Madrid in 2007. In 2012, he completed his Ph.D. studies with Honours in the laboratory of Prof. Perez-Vizcaino at the University Complutense of Madrid, where he focused on studying the relationship between metabolic diseases and pulmonary hypertension. Dr. Moral-Sanz completed his scientific training as a visiting researcher at The Medical University of Graz (Austria, Prof. A. Olschewski) and The University of Manchester (United Kingdom, Prof. A.M. Gurney) in projects funded by the CIBERES and Ministry of Science and Innovation. The further pursuit of the link between metabolic alterations and pulmonary vascular disease took Dr. Moral-Sanz to his postdoctoral studies at The University of Edinburgh in 2013, where he joined Prof. A. M. Evans' group to lead a project funded by the British Heart Foundation into the study of an essential regulator of energy balance and metabolism, the AMP-activated protein kinase (AMPK), in the pulmonary vascular physiology and pathophysiology. During his postdoctoral period, he developed an increasing interest in cellular senescence that took him to the IMDEA Food Institute in 2019, where he joined the Translational Venomics Research Line led by Dr. M. Ikononopoulou to better understand cellular senescence in health and disease and to explore a new generation of venom-derived senolytics.



Juan Moreno Rubio Ph.D.

Senior researcher in the Clinical Oncology Group ("Precision Nutrition and Cancer" Program) of IMDEA food. Coordinator of the Laboratory of Precision Oncology (POL) of the Infanta Sofia University Hospital (HUIS). Degree in Molecular Biology and Biochemistry from the Autonomous University of Madrid in 2004, and Doctorate in Biochemistry, Molecular Biology and Biomedicine (Excellent Cum Laude) by the Autonomous University of Madrid in 2010 with award for the best doctoral thesis (IISFJD). Formerly coordinator of the Laboratory of Translational Oncology at the La Paz University Hospital (HULP, IdiPaz, group 32). Author or co-author in more than 27 articles in international journals, registered 3 patents and researcher in multiple studies and competitive clinical and translational projects. Currently focused on efficiently and quickly transform the knowledge obtained from basic research in clinical applications that result in health benefits.



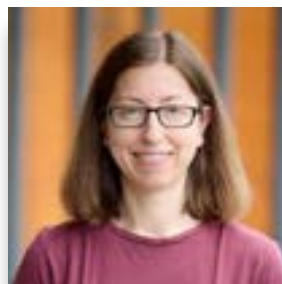
**Victor de la O Pascual
Ph.D.**

Victor de la O Pascual is a postdoctoral researcher who obtained his Dietetics and Nutrition Degree from the University of Navarra in Pamplona in 2017. During the last five years, he has actively contributed to the field of preventive medicine and public health as part of the School of Medicine at the University of Navarra in Pamplona, working under the guidance of Prof. Miguel Ángel Martínez-González. His research during this period has been dedicated to the investigation of the impact of dietary patterns rich in protein and protein/amino acid sources on cardiometabolic health. In 2022, Victor successfully completed advanced studies and earned a doctoral degree in Applied Biomedicine, specializing in Preventive Medicine, Public Health and Biostatistics in the University of Navarra. His doctoral research was conducted under the supervision of Prof. Miguel Ruiz-Canela, chair of the department. Currently, Victor's primary research focus revolves around the cutting-edge fields of biostatistics, Big Data analytics, and the development of machine learning models within the realm of precision nutrition and medicine. He is a key member of the Precision Nutrition and Cardiometabolic Health program at IMDEA Food, where he works closely with Professor Alfredo J. Martínez.



**Cristina Pantoja Castro
Ph.D.**

Cristina Pantoja obtained her PhD in 2002 in the laboratory of Dr. Manuel Serrano at the Spanish National Center of Biotechnology (Madrid), where she was working on the molecular mechanisms implicated in the cellular senescence in mouse embryo fibroblasts. In 2003, she joined the group of Dr. Daniel Peeper at the Netherlands Cancer Institute (Amsterdam) as a postdoctoral fellow, working on the identification of novel genes involved in breast cancer by using functional screens with a retroviral RNA interference (RNAi) library. At the end of 2004, she came back to Manuel Serrano's lab at Spanish National Cancer Research Center (CNIO) where she has been involved in several projects aimed to understand the relationship between cellular senescence, tumor suppression, damage and reprogramming. In May 2017, she moved to IRB Barcelona as a Research Associate, where the group of Dr. Manuel Serrano was relocated. In May 2018, she joined the Metabolic Syndrome group at IMDEA Food Institute.



**Virginia Pardo Marqués
Ph.D.**

PhD in Biology. Virginia Pardo Marqués studied Biology at the Alcala de Henares University and a Master in Cell Signaling and Therapeutic Targets in the same university (2009). Then, she obtained her PhD in 2014 in the laboratory of Dra. Ángela M. Martínez Valverde at the Institute of Biomedical Research "Alberto Sols" (IIIBm-CSIC) in Madrid, where she was working on the molecular mechanisms of insulin resistance associated to inflammation in obesity and non-alcoholic liver disease states. In 2016, she joined the group of Dra. Rocío García Carbonero at the Hospital 12 de Octubre (Madrid), working on development of new drugs or therapeutic strategies in the field of gastrointestinal tumours, particularly pancreatic and colorectal cancer, and the development of biomarkers of diagnostic. In 2017, she moved to Laboratory of Clinical Translational Oncology at the Hospital 12 de Octubre, where she focused on several projects aimed to study of new biomarkers for the diagnosis of lung and breast cancer. In January 2019 she joined the Posttranscriptional Regulation of Metabolic Diseases Group at IMDEA Food Institute where her research is focus on the role of novel posttranscriptional regulators of insulin signaling and metabolism.



Silvia Cruz Gil Ph.D.

Silvia Cruz Gil obtained her Biochemistry Degree at Universidad Complutense de Madrid in 2013. In January 2019, she obtained her PhD Degree focused on the role of the lipid metabolism in tumor progression in the Molecular Oncology Group (IMDEA Food Institute). During her research career she has worked in the field of tumor progression and lipid metabolism, as well as in the detection of new biomarkers, therapeutic targets, and nutritional precision strategies in diet-related tumors. She has also extensive experience in organoids handling and on its genetic manipulation. She obtained a Boehringer Ingelheim Travel Grant to perform a research stage in the University Hospital Carl Gustav Carus (Dresden, Germany) to learn organoids technique, under the supervision of Dr. Daniel Stange. She has also been training in the organ-on-a-chip technique for the development of a platform that allows a more precisely study of precision nutrition strategies in different contexts of metabolic diseases. She has published in different articles in top-level scientific journals (Q1) and several congresses. She has also participated in numerous international and national research and innovation projects, such as the EIT Food program and been involved in different scientific communication and dissemination activities



**Raquel Sánchez Baltasar
Ph.D.**

Raquel Sánchez Baltasar is a postdoctoral researcher at the IMDEA Food Institute, where she focuses on drug repurposing strategies for cancer treatment. Her research aims to identify new therapeutic applications for existing drugs, optimizing their use in oncology and precision medicine. She earned her PhD in Molecular Biosciences from the Autonomous University of Madrid (2024), with a thesis on RASAI-deficient models and their role in breast cancer and other associated pathologies. She also holds a Master's in Biomedical Research from the Complutense University of Madrid and a Bachelor's degree in Biology from Rey Juan Carlos University. Throughout her career, she has worked at renowned research institutions, such as the Center for Energy, Environmental, and Technological Research (CIEMAT) and the 12 de Octubre University Hospital, contributing to research on cancer, gene therapy, and flow cytometry. Her scientific contributions include publications in high-impact journals such as *The CRISPR Journal* and *Cancers*, as well as presentations at national and international conferences like the ASEICA International Congress and the ESGCT Annual Congress. Raquel continues to expand her research, exploring new applications in the treatment of cancer.



**María Sereno Moyano
Ph.D.**

María Sereno finished her undergraduate studies in Medicine and Surgery (1999) in Universidad Autónoma de Madrid (UAM). She did her medical residency in La Paz University Hospital (2000-2003) and a Master's Degree in Palliative Care (1997) in Universidad Autónoma de Madrid (UAM). She obtained the Degree of Doctor of Medicine (2005). She did a postdoctoral internship in Thoracic Program with Prof. S. Antonia in Moffit Comprehensive Cancer Center in South Florida University (Tampa, Florida). She did a Master's Degree in Molecular Oncology in the Oncology Research National Cancer Institute (2007-2009) in Madrid and another Master's Degree in Immunooncology in Medical Department in Alcalá University (2017). She was the attending physician of Medical Oncology in Gastrointestinal and Thoracic Cancer unit from 2004-2008 and then, she moved to Infanta Sofía University Hospital (San Sebastian de Los Reyes, Madrid), where she is working in Thoracic and Genitourinary Tumors section. She is associate professor in European University of Madrid (UEM). She had published several papers and has participated in different translational oncology projects, some of them with public support, as FIS and Plan Nacional. Currently his line of research focuses on lung cancer.



**Mercedes Sotos Prieto
Ph.D.**

Mercedes Sotos Prieto, PhD, is a nutritional epidemiologist and Tenured Associate Professor of Preventive Medicine and Public Health at the Universidad Autónoma de Madrid, as well as an Adjunct Assistant Professor at the Harvard T.H. Chan School of Public Health. She earned her European PhD in Epidemiology and Public Health from the University of Valencia in 2012. She completed a postdoctoral fellowship at Harvard, where she was recognized as Outstanding Postdoctoral Researcher of the Year. She later obtained a prestigious Ramón y Cajal research fellowship in Spain (2020). Her research focuses on dietary patterns, lifestyle, cardiovascular disease, and healthy aging, with a strong emphasis on translational nutritional epidemiology. She has extensive experience in randomized controlled trials (such as PREDIMED and Feeding America's Bravest) and international cohort studies, including the Nurses' Health Study, Health Professionals Follow-up Study, EPIC, ENRICA, and UK Biobank. Dr. Sotos-Prieto has authored over 120 peer-reviewed publications, many as first author in top-tier journals such as *The New England Journal of Medicine*, *Circulation*, and *JAMA Network Open*. She currently leads several funded projects focused on plant-based diets, cardiovascular health, sustainability, precision medicine, and the integration of digital technologies in clinical practice, such as the "Healthy Heart Test" and the MEDLIFE index.



**João Tiago Estevao Tomé
Carneiro Ph.D.**

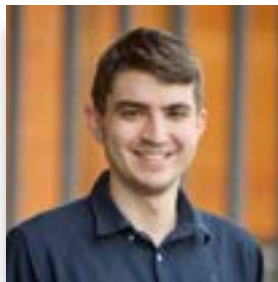
The research carried out by Dr. Joao Tiago Estevao Tomé Carneiro has been focusing on the biological activity of food constituents in chronic pathologies. He has a degree in biochemistry and he obtained his PhD at the University of Murcia working at CEBAS-CSIC (2013). He is the co-author of 30 peer-reviewed papers in relevant international journals. In 2014, he joined the Bioactive Ingredients Food Group at IMDEA Food, where he contributes to the assessment of the potential health effects of bioactive food components in vitro, in vivo and through placebo-controlled randomized clinical trials. He is currently participating in a research project focused on evaluating if the consumption of bioactive phospholipids, as part of a nutritional supplement, contributes to the improvement or delaying of mild cognitive impairment and its correlation with different biological, clinical or neuropsychological biomarkers.

Ph.D researchers & students



César Hugo Jerí Apaza

César Hugo Jerí Apaza es un profesional en el campo de la microbiología y la biología molecular, con una formación académica y experiencia en investigación y docencia. Licenciado en Biología por la Universidad Peruana Cayetano Heredia (UPCH) y máster en Ciencias de la Salud por la Universidad Pública de Navarra, actualmente cursa un doctorado en Inmunonutrición en la Universidad Internacional de Valencia (VIU). Su trayectoria profesional incluye roles como asistente de investigación en el Laboratorio de Investigación en Enfermedades Infecciosas (LID), en Clínica Universitaria de Navarra y docente en instituciones como la Universidad Nacional Mayor de San Marcos y la Universidad San Martín de Porres, donde impartió asignaturas como Biología celular y Microbiología. Como investigador, ha colaborado con el Molecular Immunonutrition Group de la Fundación IMDEA Alimentación y cuenta con publicaciones en revistas internacionales, centrados en inmunonutrición, metabolismo y enfermedades infecciosas.



Mario Astigarraga

Mario Astigarraga holds a Bachelor's degree in Biochemistry and Molecular Biology from the University of the Basque Country (UPV/EHU), Spain, completed in 2022. He later started his Master's degree studies in Bioinformatics and Biostatistics from the Universitat Oberta de Catalunya - University of Barcelona (UOC-UB), Spain, which he completed in 2024. He joined the Cheminformatics & AI Group of IMDEA Nutrition as an intern student during his MSc studies in October 2023, under the supervision of Dr. Gonzalo Colmenarejo. He rejoined the group in April 2024 as a Research Assistant; since then, he has contributed to several works including chemical analyses of gut microbial metabolites and food compounds, and their interactions with protein targets, in the context of the AI-METMI project. So far, Mario Astigarraga is a co-author of three scientific publications, two as first author, as well as one oral presentation and one poster presentation at international conferences.



Guadalupe Bazán

Guadalupe Ximena Bazán, a graduate of the Catholic University of Cuyo in Argentina, obtained her Bachelor's Degree in Human Nutrition in 2014. She worked as a nutritionist specializing in child malnutrition until 2018, when she decided to continue her studies in Spain through a Master's Degree in Human Nutrition and Applied Dietetics from the Complutense University of Madrid. In the same institution, she collaborated for three years as a clinical nutritionist in the Department of Physical Activity and Sport of the Faculty of Medicine. In January 2023, she joined the IMDEA Molecular Oncology Group as an Industrial PhD student. Her research focuses on the analysis of bioactives, especially rosemary extract, and the validation of a nutraceutical product derived from it, as a potential protector of metabolic health in breast cancer. The main objective is to achieve a product that improves the symptoms secondary to chemotherapy and hormonal treatments, and thus provide a better quality of life for women affected by this disease.



Ana Calvo Madueño

Ana Calvo Madueño is a Registered Dietitian-Nutritionist, graduated from the Faculty of Medicine at the Complutense University of Madrid (2023), and holds an Official Master's Degree in Clinical Nutrition from the European University of Madrid (2024). She is currently a member of the Molecular Oncology Group at the IMDEA Nutrition, which she joined in 2024. She is involved in the development of the MENTORING project, in collaboration with the Infanta Sofia University Hospital, focused on the implementation of precision nutrition interventions for the prevention and treatment of malnutrition in oncology patients—specifically those with lung cancer—with the aim of improving clinical outcomes and quality of life.



Lucía Carrasco Guijarro

Lucía Carrasco González obtained her Biotechnology Degree at Universidad Miguel Hernández de Elche (UMH) in 2021. During her degree, she carried out a 9-month internship in the Genetics area of the Bioengineering Institute at UMH, under the supervision of Dr. H. Cándela. In 2022, she pursued the Master's Degree in Bioinformatics for Health Sciences at Universidad de a Coruña, and conducted her Master Thesis at the VARPA group, affiliated with the Department of Computer Science. Her work focused on the application of Deep Learning approaches for the detection of sickle cell disease in retinal images and the analysis of relevant patterns for classification. Parallel to her thesis, she also joined the Genetics and Rare Diseases Research Group at the Fundación Pública Galega de Medicina Xenómica (Santiago de Compostela) for an internship. I have recently joined the Computational Biology Group at IMDEA Food Institute as a research assistant, under the supervision of Dr. Enrique Carrillo de Santa Pau. My research focuses on artificial intelligence approaches and statistical regression models to study aging-related processes, in collaboration with the multidisciplinary group on frailty, multimorbidity, and mortality patterns in the elderly population from the IdiPAZ Institute, using data from the AGED-Madrid cohort, with a particular interest in how modifiable risk factors contribute to the aging process.



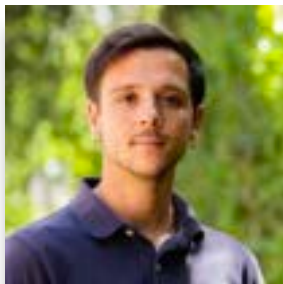
Nerea Castañeda Fernández

Nerea Castañeda Fernández completed her degree in Biology at the Complutense University of Madrid in 2021 and finished her master's in medical biology in 2024 at the same university. In June 2023, Nerea started working as a Research Assistant, funded by "Programa Investigo", in the Microbial Stress and Bacteria-Protozoa Interaction group at the Faculty of Biology of the Complutense University of Madrid, led by Dr. Francisco Amaro Torres. Nerea focused her research on the opportunistic pathogen *Burkholderia cenocepacia*, specifically studying how protozoan predation influenced the bacteria's stress resistance and antibiotic tolerance. Since October 2024, Nerea has been working as a Research Assistant at the IMDEA Food Institute, in the Cellular and Molecular Gerontology group, under the supervision of Dr. Alberto Díaz-Ruiz. Her current research focuses on the molecular mechanisms underlying cellular aging and potential interventions to improve health in old age.



Jose Antonio Celada Guerrero

José A. Celada Guerrero is a nutritionist with a strong background in clinical nutrition and applied research. He holds a degree in Human Nutrition and Dietetics from the Autonomous University of Madrid and a Master's in Genetic, Nutritional, and Environmental Determinants of Growth and Development from the University of Granada. His career has developed in leading institutions such as IMDEA Food and ICTAN-CSIC. His profile blends clinical and research expertise, with a prominent role in clinical studies like PREDIMED-Plus, where he applied advanced molecular biology techniques, immunological and nutritional biomarker analysis, and designed nutritional intervention therapies. He is currently pursuing his PhD within the ENSATI project at IMDEA Food, focusing on personalized strategies in precision nutrition. In addition to his research work, he has extensive experience in clinical practice, nutrition counseling, science communication, and public education, bridging scientific knowledge with practical application. His contributions to international conferences and publications in high-impact journals reflect his dedication to advancing knowledge in metabolic health and immunonutrition. With a multidisciplinary approach and a clear commitment to translational science, Celada Guerrero represents an emerging voice in the field of personalized nutrition and research aimed at improving metabolic well-being.



Diego Coletto Checa

Diego Coletto Checa obtained his Bachelor's degree in Biology from the Universidad de Granada in 2021, where he completed his Bachelor's thesis in the Genetics Department on molecular phylogenetics. After graduating, he pursued the "Master's Degree in Hospital Biological Specialties" at UDI-MA, broadening his clinical laboratory expertise. He later finished the Master's Degree in Bioinformatics & Data Science for Precision and Personalized Medicine and Health at the "Instituto de Salud Carlos III". His MSc thesis, carried out in the Computational Biology Group at IMDEA Food under the supervision of Dr. Laura Judith Marcos Zambrano and Dr. Enrique Carrillo de Santa Pau, entitled "*Comparative Evaluation of Bioinformatic Approaches for Intestinal Mycobiome Analysis: Non-Responsive Coeliac Disease and Obesity as Case Studies*". In March 2025 he joined the Computational Biology Group at IMDEA Food Institute, within the research line on Host-Microbiome Interactions. His work is framed in the GutPlantHealth project, which investigates the effect of plant-based diets in health.



Nicolas de Cárdenas Roig

Nicolás de Cárdenas Roig is a research assistant in the Computational Biology group at IMDEA Food. He obtained his Bachelor's degree in Biology from the Universidad Autónoma de Madrid (UAM) in 2023 and his Master's degree in Computational Biology from the Universidad Politécnica de Madrid (UPM) in 2024. During his Bachelor's thesis, under the supervision of Dr. Lidia Daimiel, he collaborated with IMDEA Food on a personalized nutrition project. He also gained international experience in medical image analysis using deep learning at the Catholic University of Leuven (Belgium), and later worked on modelling bacterial dynamics under the supervision of Dr. Alfonso Rodríguez-Patón at the Artificial Intelligence Lab of the Universidad Politécnica. He is currently involved in the AI4Food-CM project, where he focuses on the computational analysis of human microbiome data and the development of artificial intelligence models to integrate omics and digital sensor data, aiming to advance personalized nutrition and the prevention of chronic diseases.



Sara del Buono

Sara Delbuono is a highly skilled and dedicated Dietitian-Nutritionist currently working as a Research Assistant in the NUCONEP group at IMDEA Food. Her work focuses on precision nutrition strategies aimed at combating obesity and metabolic diseases. Sara is completing her Master's degree in Nutrition and Health through the Universitat Oberta de Catalunya (UOC), further enhancing her expertise in the field. With extensive clinical consultation experience, Sara excels in handling and processing biological samples, conducting nutritional evaluations, and supporting personalized dietary interventions. Her proficiency in advanced metabolic assessments, including DXA, bioimpedance analysis, indirect calorimetry, and FibroScan, allows her to gain a deeper understanding of individual metabolic phenotypes and their epigenetic influences. Sara actively contributes to the design and implementation of clinical studies, playing a crucial role in data collection and translational research efforts. Her goal is to develop tailored nutritional approaches that improve health outcomes and promote effective strategies for the prevention and treatment of obesity.



Andrea del Saz Lara

Andrea del Saz Lara is a doctoral student in the Epigenetics of Lipid Metabolism research group at IMDEA Food Institute, led by Alberto Dávalos. Her research focuses on the role of epigenetic mechanisms in the prevention and management of cardiometabolic diseases, exploring how dietary bioactive components can influence gene expression regulation. Throughout her Ph.D., she has worked on the identification of new therapeutic strategies through the modulation of epigenetic pathways—particularly DNA methylation and microRNA expression. Her thesis specifically investigates the epigenomic effects of hydroxytyrosol, the most abundant phenolic compound in extra virgin olive oil, known for its antioxidant, anti-inflammatory, and cardioprotective properties. Andrea employs in vitro and in vivo models, as well as high-throughput techniques such as methylation arrays and RNA sequencing, to understand how hydroxytyrosol modulates the expression of key genes involved in lipid metabolism, among others. Her aim is to contribute to the development of personalized nutrition approaches for the prevention of metabolic disorders. She has presented her work at national and international conferences and has collaborated in several multidisciplinary research projects focused on nutrigenomics and functional foods.



Sabela Fernández Vila

Sabela Fernández Vila is a Doctoral Student in Molecular Medicine at the University of Santiago de Compostela, supervised by Prof. Laura Sánchez Piñón and Dr. Maria Ikonomopoulou at IMDEA-Food Institute. Her research focuses on investigating the antitumoral activity of various venom-derived compounds in different tumorigenic cell lines and zebrafish xenograft models of cancer. She is a qualified high school teacher and teaches molecular biology to laboratory technicians. She holds a degree in Nursing and an MSc in Genetic, Environmental, and Nutritional Conditions from the University of Santiago de Compostela in Spain.



Isabel Fernández Carrasco

Isabel Fernández is a PhD student in the Translational Venomics Group at IMDEA Food Institute under the supervision of Dr. Maria Ikonomopoulou. She holds a degree in Biotechnology from Universidad Francisco de Vitoria (2019) and a Master's degree in Neuroscience from Universidad Autónoma de Madrid (2021). In 2019, Isabel joined the research group of Prof. Dr. Ivan Dikic at the Buchmann Institute for Molecular Life Sciences in Frankfurt, where she studied the non-canonical ubiquitination process carried out by different pathogens. She later completed her master's thesis in Teresa Iglesias' group at the IIBM Alberto Sols in Madrid, focusing on the molecular mechanisms involved in neurodegeneration triggered by the elimination of PKD1 in neurons. In 2021, Isabel joined the Translational Venomics Group at IMDEA Food Institute as a research assistant. She was subsequently awarded an international predoctoral fellowship by the Madrid Government. Her thesis focuses on the applications of venom-compounds in ageing and ageing-related diseases, including cancer.



Alfonso Gorostegui

Alfonso De Gorostegui Álvarez De Miranda earned a Bachelor's degree in Biomedical Engineering from TECNUN Universidad de Navarra in 2018, and then completed an MSc in Genomic Medicine at St. George's University of London in 2019. In 2020, he began a PhD in Neuroscience at Universidad Autónoma de Madrid, where he developed Deep Learning models and signal-processing techniques to study gait patterns in children with walking impairments. During his doctoral studies, he also completed a three-month research stay at the Central Remedial Clinic in Dublin. In 2024, he joined the Molecular Oncology Group at IMDEA Nutrition as a Biostatistician, where he has focused on developing statistical models to identify actionable biomarkers by integrating clinical, genetic, and microbiome data in different risk populations.



Andrea Higuera Gómez

Graduated in Human Nutrition and Dietetics at Universidad Complutense of Madrid. Master in Nutrigenomics and Personalized Nutrition at the Universidad de las Islas Baleares. She obtained University Expert in Sports Nutrition from the Universidad Isabel I and the International Institute of Physical Exercise and Health Sciences. She is a doctoral student in the Food Sciences Program of the Universidad Autónoma de Madrid with a research contract at IMDEA Food in the Precision Nutrition and Cardiometabolic Health group. She has experience in nutrition and dietetics consultation since 2015. She has collaborated in different work projects related to nutrigenomics and personalized nutrition focused on improving the patient's nutrition and health. She has also received a 2-year scholarship from the Agencia Española de Protección de la Salud en el Deporte (AEPSAD) at the Centro de Alto Rendimiento de Madrid (CAR Madrid) in the Department of Endocrinology and Nutrition. At the same time, she has tutored the practices of the Human Nutrition and Dietetics degrees to students from the Complutense University of Madrid and the University of Navarra. Currently, she combines her work in the nutrition practice with the METAINFLAMACIÓN project at Hospital Universitario Puerta de Hierro and her doctoral thesis in the NUTRiMDEA personalized and precision nutrition project.



Blanca Lacruz Pleguezuelos

Blanca Lacruz Pleguezuelos is a pre-doctoral researcher at IMDEA Food, pursuing her PhD in the Molecular Biosciences Program at the Universidad Autónoma de Madrid (UAM) since 2022, under the supervision of Laura J Marcos and Enrique Carrillo. Her work, funded by a Formación del Profesorado Universitario (FPU) fellowship, focuses on the gut microbiome and host-microbiome interactions through systems biology and artificial intelligence methodologies. In 2023, she completed a three-month research stay at the Toulouse Cancer Research Center (CRCT), supervised by Vera Pancaldi and funded by a Short-Term Scientific Mission (STSM) grant from the COST Action ML4Microbiome. She earned her Master's degree in Bioinformatics and Computational Biology (UAM) in 2022, developing her Master's thesis at IMDEA Food. She previously obtained a Bachelor's degree in Biochemistry from UAM in 2020. During her undergraduate studies, she completed her thesis at the CBMSO under the supervision of María Yáñez-Mo with the support of a Collaboration Grant, and was awarded a UAM-BU Fellowship to study a semester at Boston University in 2018. As part of her FPU fellowship, she also contributes to teaching activities at UAM's Department of Biochemistry, participating in programming courses. In addition, she regularly participates in science communication initiatives.



Andrés López González

Andrés López González is a dedicated and proactive Nutritionist-Dietitian specializing in Molecular Nutrition and Metabolism. Currently pursuing his PhD, Andrés focuses on the role of dietary polyamines, betaine, and choline in cellular epigenetics, particularly in relation to cardiometabolic health and aging. His research aims to uncover the intricate connections between diet and gene expression, contributing to advancements in precision nutrition. Andrés brings a wealth of experience to his current role. He has previously worked as a Nutritional Advisor at Abbott Nutrition and Nutricia (Danone), where he played a key role in the scientific-medical strategy for product launches and provided critical support for medical nutrition brands. His expertise extends to clinical trials, where he collaborates with multidisciplinary teams to ensure the successful execution of nutritional studies. With a Master's degree in Nutrition, Food, and Metabolism from the University of Navarra and a Bachelor's degree in Human Nutrition and Dietetics from the Autonomous University of Madrid, Andrés has a strong academic foundation.



Lorena López Lora

Lorena López Lora is a key member of the NUCONEP research group, contributing to cutting-edge advancements in precision nutrition targeting obesity and metabolic disorders. With a solid foundation in Nursing and a degree in Human Nutrition, Lorena López also holds a Master's degree in *Genetic, Nutritional, and Environmental Determinants of Growth and Development*, equipping her/him with a multidisciplinary perspective essential for tackling complex health challenges. In her current role, Lorena López brings technical expertise and scientific rigor to the extraction and processing of biological samples and the design and implementation of nutritional assessments and interventions. Skilled in the use of advanced metabolic diagnostics—including DXA, bioimpedance analysis, indirect calorimetry, and FibroScan—Lorena López plays a vital role in generating high-resolution data for the study of individual metabolic profiles and their epigenetic regulation. Beyond the lab, Lorena López actively contributes to the development of clinical protocols, high-quality data collection, and the execution of translational research initiatives. Her work supports the overarching goal of the group: to develop personalized, evidence-based strategies for the prevention and treatment of obesity. Recognized for her precision, adaptability, and collaborative spirit, Lorena López stands out as a promising early-career researcher making a measurable impact in the field of metabolic health and precision nutrition.



Victoria Martín Santiago

Victoria Martín Santiago is a first year Ph.D. student in the Epigenetics of Lipid Metabolism research group headed by Dr. Alberto Dávalos at IMDEA Food Institute. Her thesis work focuses on the study of the metabolic and epigenetic effects derived from the consumption of polyethylene terephthalate (PET) nanoplastics. Her current activity includes the preparation and characterisation of PET nanoparticles, both from pure polymer and from commercial bottles. Also, the study of their bioavailability and in-vitro effects. In the coming months, models such as intestinal organoids and C57BL/6 mice will be used to evaluate markers of oxidative stress, inflammation and enzyme activity. In addition, possible epigenetic changes associated with chronic consumption of these nanoparticles will be analysed.



Carmen Mazario Gárgoles

Carmen Mazario Gárgoles obtained her degree in Biomedicine from the Universidad Francisco de Vitoria (Madrid) in 2021, and a degree in Innovation Project Management and Entrepreneurship in 2020. In 2022, she continued her training by obtaining a Master's degree in Clinical and Applied Research in Oncology. In 2024, she joined Institute IMDEA Alimentación, within the Epigenetics of Lipid Metabolism Group led by Dr. Alberto Dávalos, to start her PhD thesis. Her current research focuses on exploring alternative and sustainable sources of extracellular vesicles (EVs) derived from by-products of the dairy and vegetable industries. These EVs being studied as potential nanocarriers to improve the bioavailability and bioactivity of (poly)phenols for biomedical applications, thus promoting the use of industrial co-products. In addition, she is evaluating the possible epigenetic effects derived from diet and accidental ingestion of nanoplastics, with the aim of identifying their impact on health and disease.



Andrea Ochaita Aguado

Andrea Ochaita Aguado graduated in Biochemistry in 2022 and took the MSc in Immunology Research in the class of 2023, both from the Complutense University of Madrid (UCM). Subsequently, she spent three months at the Institute Lung Research in Marburg (Germany). Upon her return, in 2024 she joined the Molecular Oncology group at IMDEA Food with a "Formación de Personal Investigador" grant in the framework of the ON PRIME project, where she is developing her PhD in Biomedical Research (UCM), focusing on the immunometabolic characterization of oncology patients through Open Array techniques, conventional flow cytometry, study of the microbiota by 16S amplicon sequencing and epigenetics with Illumina technology.



Alba Pérez Cuervo

Alba Pérez Cuervo obtained her Bachelor's degree in Biotechnology from Universidad CEU San Pablo (Madrid) in 2022. She later completed two Master's degrees at Universidad Autónoma de Madrid: one in Biomolecules and Cellular Dynamics (2022-2023), and another in Bioinformatics and Computational Biology (2023-2025). In 2023, she joined the IdiPaz Biomedical Research Institute, where she conducted her first MSc research project on the NOD1 receptor's role in modulating doxorubicin-induced cardiotoxicity. In 2024, she completed her second MSc project at the IMDEA Food Institute, developing a machine learning algorithm to predict Alzheimer's disease onset using metagenomic data and identifying therapeutic targets. She gained early research experience as a research assistant at InVitroTecnica S.L. (2022), contributing to vaccine development by optimising antigen production. She has participated in international academic collaborations, including the COIL project on personalised nutrition and genetics (2021-2022), and in outreach initiatives such as *MicroMundo*, which raises awareness about antimicrobial resistance. In March 2025, she joined the Computational Biology Group at the IMDEA Food Institute as a bioinformatics research assistant. Her role focuses on supporting research activities within the group's line on *Digital Health through Artificial Intelligence in Nutrition*. Initially, she is continuing her Master's thesis, now applying it to Parkinson's disease datasets and incorporating topological network analyses.



Laura Rubio Gordón

Laura Rubio obtained her Medical Degree in 2011 from the Complutense University of Madrid. She completed her specialization in Pediatrics at La Paz University Hospital in Madrid, finishing her subspecialty in Pediatric Neurology in 2016. With over a decade of clinical experience, she has developed a profound understanding of pediatric health and neurological conditions. In 2023, she expanded her expertise by completing a Master's Degree in Artificial Intelligence and Big Data in Health at the Autonomous University of Barcelona. Her Master's Thesis, titled "Early Prediction of Childhood Obesity Using Artificial Intelligence Tools in Primary Care," reflects her innovative approach to integrating technology with healthcare. Since November 2023, she has been a predoctoral researcher at IMDEA Food, with a contract funded by CIBERobn / ISCIII. At IMDEA Food, she combines her medical background with advanced skills in data analysis, database management, machine learning, deep learning, Python, R, and various bioinformatics tools. Her research focuses on personalized nutrition and the development of predictive models to enhance the individualization of nutritional counseling for patients with obesity.



Javier Salazar

Javier Salazar is a biology undergraduate at the Autonomous University of Madrid (UAM), with a strong focus on genetics and molecular biology. His primary interest lies in cancer genetics and the molecular mechanisms driving this disease, a field he has explored through advanced coursework and hands-on laboratory experience. In addition to his academic pursuits, Javier is a qualified Clinical and Biomedical Laboratory Technician. He gained practical experience in biochemistry, microbiology, immunoassays, and cytogenetics while working in the clinical analysis laboratories of HM Hospitals. Recently, Javier completed an internship in the Precision Nutrition and Aging Research Program at IMDEA Food. He is currently conducting his Bachelor's thesis in the Translational Venomics Group, where he investigates the antitumor properties of a peptide derived from the venom of *Octopus kaurina* on melanoma cells.



Andrés Sánchez Ruiz

Andrés Sánchez Ruiz (PhD Student in Medicinal Chemistry) graduated with a degree in Biotechnology from Rovira i Virgili University. Then he completed a M.Sc. in Translational Medicine at the University of Barcelona in 2019, and another in Bioinformatics and Biostatistics at the Open University of Catalonia-University of Barcelona, Spain, in 2020. By the end of that year, he delved into artificial intelligence through the implementation of Recurrent Neural Networks to classify scientific articles by their topic. Building on this trajectory, he joined the Cheminformatics & AI Group at the IMDEA Nutrition Institute in 2021 as a Research Assistant, where he continued applying machine learning algorithms to predict the bioactivity of food compounds against human targets. Two years after that, he started his PhD in Drug & Nutraceutical Discovery, where he integrates artificial intelligence, molecular docking, and cheminformatics to identify novel drugs and nutraceuticals. Currently his work focuses on developing pipelines for the automation of virtual screening workflows, as well as deep learning models for the discovery of potential drug and nutraceutical candidates. So far, Andrés Sánchez-Ruiz has coauthored 8 papers (three as first author), 4 international and national oral communications, and 5 posters.



Visiting

Helena Fernández Sanz

Universidad Autónoma de Baja California Sur (México)

Bojana Blagojevic

Faculty of Agriculture University of Novi Sad

Diego Martínez Urbistondo

Clínica Universidad de Navarra

Rocío García de la Garza

Clínica Universidad de Navarra

Ana Bajo Buenestado

Clínica Universidad de Navarra

Gabor Hajdú

Universidad Semmelweis, Hungría

Laura Torrico Pescuezo

UAM

Sofía Ramos García

UAM

Anna Busiakiewicz

IES Mirasierra

Eray Akgun

Akdeniz University

Francisco Javier Salazar Castejón

UAM

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Carmen Zamora Cañadas

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University of Huddersfield-EIT Food

Guillermo Fernández Fruns

UCM

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Megan Fernandez Thomas

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Marta Garrido Novelle

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Alberto Macía de Torres

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Claudia Arroqante

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M Carmen Guijarro Guijarro

SERMAS

Clara Gómez Acebo

UEM

Juan Antonio Nieto Fuentes

VIU

Yaiza Pedroche

IdiPAZ

Cristina Rodríguez Osorio

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Anneiris Duarte

VIU

Hitcham atoui

Université Mohammed VI des sciences et de la santé

Sara García Ventura

UAM

Irene Besne Eserverri

Universidad del País Vasco/
Euskal Herriko Unibertsitatea

Daniel Pinho

Universidad de Coimbra

Silvia Vizoso

UCM

Laura Gómez Martínez

Hospital Clínico San Carlos

Sara Barbado

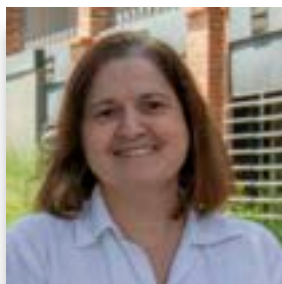
FP Centro Superior de Altos Estudios Internacionales (IFP)

Cyndy Vanessa Pinto

FP IFPM IV Poniente



innovation, transfer & communication PLATAFORM



María Jesús Latasa

Head of Education and
International Projects

Doctor of Pharmacy, specialising in Biochemistry and Molecular Biology, from the University of Alcalá, having carried out her doctoral research at the Alberto Sols Institute of Biomedical Research in Madrid (CSIC) on the genomics of Alzheimer's disease. After five years of postdoctoral research at UC Berkeley (California, USA) on the genomics of lipid metabolism genes, she rejoined the CSIC as a Ramón y Cajal researcher, first at the Cajal Institute and then at the Alberto Sols IIBM to work on the development of the nervous system. In 2014, she joined IMDEA Food as a researcher in the Lipid Metabolism Epigenetics group. In 2015, in parallel with his research activity, he began to develop functions as a liaison between the Institute and the coordinator of European actions of the IMDEA network of research institutes to which the Institute is linked. He participated in several working groups (Education, Governance and Content) during the preparation phase of the project proposal submitted to the EIT call for proposals related to Food. Since 2023, he has been the Master contact for IMDEA Food for EIT Food.



Lourdes Castán Toro

Head of Communications
and Public Affairs

Degree in Information Sciences, specialising in Journalism, with an official Master's degree in Tourism Management and Planning, and an Executive Master's degree in Digital Business, and her sights set on innovating business models, digitisation projects in organisations and everything related to data strategy. She has extensive specialised training and also works as a teacher. Her professional experience has been mainly in the public sector. Her duties have focused on external and internal communication and strategic planning, accompanied by the development of public narratives adapted to different channels, budget execution and human resources. More recently, she has carried out consulting work for the private sector in business processes, marketing and digital transformation, and in areas such as food, law and technology start-ups. At IMDEA Food, she has also served as Project Manager on European projects such as WE Lead Food, Food Solutions and HEI (Headlines), aimed at technology-based entrepreneurship in universities and research centres in the Health and Food vertical; consolidating a network of women leaders within the food sector; and training young people in innovative solutions, in addition to other work in innovation and public affairs.



Antonio Verde Cordero

Legal and transfer
coordinator

Law degree from the Autonomous University of Madrid, with a Master's degree in European Union Labour and Tax Law. Over 30 years of professional experience in R&D&I management and promotion, which has enabled him to develop strong team management and organisational skills, analytical and decision-making abilities, experience in dealing with different stakeholders in society, and extensive knowledge of the Spanish business environment and the national R&D&I system. Participated in the creation of the Autonomous University of Madrid Foundation and was a member of the board of the OTRI University Network for five years. He also participated in the launch and subsequent development of the Centre for Entrepreneurial Initiatives of the Autonomous University of Madrid (CIADE), as well as in the design and creation of the Madrid Science Park (PCM) and its Foundation, from 2000 to 2003.



Alejandro Arranz Calvo
General Manager



**Inmaculada Galindo
Fernández**
Programme Coordinator



Leyre Soler Castelló
R&D Talent Project Management
Technician



Gema Alegre
Accounting Manager



management



publ

most relevant indications

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scientific highlights

Strategic contribution to CARDIOPREV: advancing cardiovascular health through Precision Nutrition and Genomics

Our group has actively contributed to the CARDIOPREV study by applying genomic tools and advanced analytics to investigate diet-gene interactions in cardiovascular health. We demonstrated that higher dietary antioxidant intake, particularly via a Mediterranean diet, slows atherosclerosis progression. Additionally, our analysis of lipoprotein subfractions revealed an inverse association between medium HDL particle levels and peripheral artery disease, reinforcing the value of precision nutrition in cardiometabolic risk management.

Microsei Biotech: A Spin-off from IMDEA Food Transforming Microbiome Science into Impactful Solutions

Interaction with industry represents a key element for both economic and social progress. In this context, our innovative research has significantly impacted the technological sector. By the end of 2024, the project took a significant step forward with the establishment of a spin-off, Microsei Biotech SL. The company's primary activity (CNAE-7211 reference) focuses on experimental research and biotechnology development. We aim to produce microbiota-based medications.

Microsei Biotech was founded by Enrique Carrillo de Santa Pau, Alberto Díaz-Ruiz and Laura J. Marcos as a spin-off of the IMDEA Food Institute. The company emerged from the scientific work of the Computational Biology Group and the Cellular and Molecular Gerontology Lab, through their participation in various entrepreneurship programs. Microsei aims to transform research on host-microbiota interactions into innovative, health-oriented solutions.

Our proposal was also selected to participate in two prominent entrepreneurship promotion programs founded by the Foundation for Knowledge madri+d: Healthstart Madrid and DeepTech Madrid.

Delivery of dietary polyphenols in extracellular vesicles enhance biodistribution to tissues and biological activity

Ellagitannins and ellagic acid metabolites, urolithins (Uros) have anti-cancer activity. However, their efficacy is limited in systemic tissues by phase-II metabolism. We loaded milk exosomes (EXOs) with urolithins and evaluated their brain delivery and anticancer effects compared to non-encapsulated Uros after intra venous injection. Loading EXOs with the main three Uros boosts their delivery to the rat brain. EXO-Uros, unlike free forms, exert a potent anticancer effect on neuroblastoma cells. Overall, encapsulating Uros into EXOs is promising for enhancing brain delivery and anticancer activity.





Mediterranean diet versus Planetary health diet: which one is best?

Plant-based diets, such as the Planetary Health Diet (PHDI) and the Mediterranean Diet (Med), offer notable advantages for human and planetary health. However, knowledge on the PHDI's benefits is limited, particularly in Southern European countries where the Med is culturally rooted and is an environmentally sustainable dietary pattern. This study, conducted with the ENRICA-cohort, a higher adherence to the PHDI and the MEDAS index (representing the Med) was similarly associated with lower all-cause mortality and showed comparable low environmental impact.

Exploration of Epigenomic Modulation by Nutrition.

To comprehensively investigate how nutrients and dietary patterns exert their influence at the cellular epigenomic level. Our focus is on the precise characterization of alterations in DNA methylation marks and the expression levels of key microRNAs that regulate the central molecular pathways of aging. Through rigorous nutritional intervention trials, our group seeks to unravel the potential of foods and their bioactive components as modulators of the obesogenic epigenome, with the goal of applying this knowledge to the creation of precision foods for the prevention of cardiometabolic diseases and the promotion of healthy biological aging.

Concluding the NUTRISION-CM project in collaboration with M.Mittelbrunn (PI Immunometabolism Lab) it has been demonstrated that overweight and obese individuals exhibit an accelerated decline in immune function and how nutritional interventions can counteract the immune deterioration linked to excess body weight in both humans and mice. The research will be reflected in a submitted publication in Nature Metabolism (*Cristina M Fernández-Díaz, ..., María Mittelbrunn & Ana Ramírez de Molina. Mild weight loss reduces obesity-induced immunosenescence*) and continuing this research line, we will develop Precision nutrition strategies for cancer patients based on their immunometabolic classification with the ON-PRIME project.

Gut microbial metabolites and food compounds interact with proteins in different modes than systemic drugs

In a couple of recent publications, through a statistical analysis of all complexes of microbial metabolites and food compounds with proteins in the Protein Data Bank, we have been able to find that these molecules use different sets of functional groups and interaction types with proteins than oral systemic drugs. This dataset and analysis provides key information to develop new drugs using these molecules as templates and with biodistribution properties.

European Patent and PCT Submission

Filed European patent #EP23382726.0 (2023) and Patent Cooperation Treaty (PCT) #PCT/EP2024/069867 (2024) from Talent projects. Identified translational potential of candidates, leading to European patent for “Small proteins for use as senolytic and senomorphic agents”. Positive examination from European Patent Office prompted PCT submission. Inventors: Maria Ikonopoulou, Javier Moral-Sanz, Manuel Serrano, Valentina Ramponi, Manuel Fernandez Rojo, Isabel Fernández Carrasco.

Leadership in the development of precision nutrition in chronic diseases

We lead cutting-edge research to understand and manage obesity, type 2 diabetes, and cardiovascular disease through personalized nutritional strategies based on omics sciences and clinical data integration.

Development of predictive and personalized tools

Our group designs and validates evidence-based tools and interventions to predict individual responses to diet, supporting precision nutrition in clinical and public health settings.

Scientific excellence with global impact

We contribute to major national and international research initiatives and cohorts, generating high-impact data, publications and dissemination that shape the future of cardiometabolic health and nutritional science.

Picture Your Microbes: Participatory action research to reach awareness about gut microbiome health.

An innovative citizen science project aimed at empowering individuals at risk of developing non-communicable diseases (NCDs), particularly those living with overweight or obesity, by connecting cutting-edge microbiome research with public engagement. Through participatory focus groups, co-creation activities using the photovoice methodology, and personalized microbiome profiling, the project raises awareness of the importance of maintaining a healthy gut microbiome.

By actively involving citizens in the scientific process and disseminating results through exhibitions and social media, *Picture Your Microbes* promotes healthier lifestyle choices and fosters a deeper public understanding of the link between diet, the microbiome, and health.





Identification of immunonutritional Toll-like innate immune receptor (TLR)-4 agonists to control the inflammatory response. Definition of molecular pathways induced by immunonutritional agonists in the control of selective functional polarization of the innate immune system. Development of functional foods targeting the innate immune system for the metabolic control of sugars and fats.

Starting of the Collaborative Project Femhealth,

dedicated to find biomarkers and design nutritional strategies able to revert, reduce or mitigate health conditions associated with the menopause process. This project will be developed by the collaboration of two research centers (IMDEA Nutrition and CNIO) and two companies (Precision for Health and Enjoythealth) and will try to recruit over 100 women without, with mild and with severe menopause symptoms.

Fasting in combination with the cocktail Sorafenib:Metformin blunts cellular plasticity and promotes liver cancer cell death via poly-metabolic exhaustion.

Dual-Interventions targeting glucose and oxidative metabolism are receiving increasing attention in cancer therapy. Sorafenib (S) and Metformin (M), two gold-standards in liver cancer, are known for their mitochondrial inhibitory capacity. Fasting, a glucose-limiting strategy, is also emerging as chemotherapy adjuvant. Herein, we explore the anti-carcinogenic response of nutrient restriction in combination with sorafenib:metformin (NR-S:M) to show that the energy-based polytherapy NR-S:M blunts cellular, metabolic and molecular plasticity of liver cancer. Notwithstanding the in vitro design of this study, it holds a promising therapeutic tool worthy of exploration for this tumor pathology.

A European project that aims to revolutionise the treatment of cancer patients.

Starting of Pathfinder project *Mentoring for health* englobing six laboratories coming from four countries (Spain, Germany, Italy and Portugal). The aim of the project is to find nutritional strategies which may help lung cancer patients (both microcytic and non-microcytic) to survive and to stay in a better condition, found by personalized and precision strategies based on multiomic data.

