

# The new nutrition era: from molecular mechanisms to human health

Programme & Abstracts







# The new nutrition era: from molecular mechanisms to human health

XIII Forum

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*Programme & Abstracts*



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# Presentation

## Silvia Misiti

Head of IBSA Foundation for Scientific Research

The mission of the IBSA Foundation is to promote a science culture and to serve as a meeting point between the scientific world and the general public.

In order to achieve this goal, IBSA Foundation focuses on a range of activities, the most important of which is the organization of international Forums: these are one-day meetings that cover different and evolving aspects of new frontiers of life-science-related subject areas and bring a global network of scientists together to discuss the latest pre-publication research in their fields.

IBSA Forums – always organized in collaboration with the academic world, institutions, and leading research centers – represent a chance for speakers to compare and contrast ideas, as well as to exchange information and ideas on forward-looking topics and new developments in scientific research.

They also represent an opportunity for students, experts, and all participants to discuss issues, share insights and learn: a process of exchange that provides valuable input for further research and drives advancements in knowledge.

In each Forum prominent experts from the international scientific community focus on a significant topic in the field of biology or medicine that has a great impact on people's health and quality of life, describing state-of-art and future challenges.





# Introduction

## Lucilla Titta

Coordinator SmartFood project at Department of Exp-Oncology of IEO (European Institute of Oncology)

The 2018 IBSA Foundation Forum: “The new nutrition era: from molecular basis to human health” will gather field leaders to discuss advances in our molecular understanding of chronic diseases and aging, and their relation to human nutrition.

The quantity, quality and frequency of foods we consume is the most powerful environmental factor that would affect the health status and life expectancy of us all.

The body of scientific literature that distinguishes this observation includes epidemiological studies, in which we observe associations between food habits and the onset of diseases, nutritional intervention studies assessing the effects of food consumption on markers of disease risk and finally, to analyse the mechanisms of the effects observed, studies in animal and cellular models.

In addition nutrigenomics, the most cutting edge nutritional science that studies the effects of food on gene expression tell us that this process is constantly being modified during the transcripts in response to nutrient exposures, indicating that nutrition is the most lasting, persistent and variable environmental factor that probably contributed to shaping of the “behaviour” of the human genome.

This meeting aims to integrate existing knowledge on molecular mechanisms of metabolism and chronic diseases with emerging knowledge on the influence of hormones, nutrients and microbial flora that impact systemic metabolism.

It will be also largely discuss the growing awareness from intervention and epidemiological studies about the role of nutritional exposures in metabolic pathways and other biological networks, with lifelong implications in the state of health.

The interaction of nutrition with metabolism and human health is a rapidly evolving area of research with many essential outstanding issues and opportunities to translate basic science discoveries to clinical and public health applications.

## SESSION 1

### MOLECULAR BASIS OF THE EMERGING TOPICS IN NUTRITION

*Chairman:* Maria Rescigno





# Nutrition, longevity and genes

**Pier Giuseppe Pelicci**

European Institute of Oncology (IEO), Milan, Italy

Research on aging and, more specifically, on the molecular mechanisms governing lifespan duration is relatively new. Yet, it has made extraordinary progress over the past 30 years.

The first breakthrough that paved the way for a new era in aging research came with the discovery of the existence of genes whose inactivation determines an increase in the maximum lifespan of an individual. These genes (few dozen in all) were discovered in both invertebrates (*Drosophila* and *C. elegans*) and mammals. Since their absence determines the prolongation of life, these genes are called aging genes (genes, that is, whose activity accelerates aging).

The study of their physiological function has allowed their classification in three groups:

1. genes that enhance the activities of insulin, a hormone that regulates cell metabolism;
2. genes that increase the accumulation of oxidative stress in the tissue;
3. genes that regulate the elongation of chromosome ends, and, thus, proliferative potential in stem cells.

The existence of aging genes is not easy to reconcile in evolutionary terms, as it is not immediately clear how genes that do not increase fitness can be selected.

A second major step forward was due to the discovery of the existence of genes whose activities prolong life (longevity genes). In particular, it is thanks to

these genes if organisms are able to prolong life when subjected to calorie restricted diets (caloric restriction effect). Although detailed investigations have just begun, these genes too appear functionally connected to the regulation of cell metabolism.

Recent studies suggest that aging genes, longevity genes and caloric restriction all act on the same animal function: the capacity of an organism to adapt to the environment under conditions of nutrient deprivation. Undoubtedly, one of the big evolutionary challenges was represented by the alternation of cycles of food availability.

Finally, a third step forward came with the discovery that life extension by manipulation of aging genes or caloric restriction associates with a greater resistance to the incidence and the severity typical of aging-associated diseases (such as cancer or cardiovascular diseases). Although intuitively obvious, this suggests that the mechanisms behind the process of aging and aging-associated diseases overlap (for example, oxidative stress, insulin resistance, etc.). Applicatively, therefore, the study of the molecular mechanisms associated with aging can provide new molecular targets for the design of drugs against aging-associated diseases.

This possibility is quickly becoming very concrete. Indeed, there are at least two examples where the treatment of mice with drugs directed against the products of aging or longevity genes, respectively, has had an effect on lifespan or on some aspects of the aging-associated diseases.

All these data, while preliminary, tell us that the study of the mechanisms regulating the duration of life may have a significant impact on aging, healthy aging or aging-associated diseases. It is likely that this knowledge will have a further acceleration in the near future from studies of environmental modifications, in particular of diet, on chromatin (the complex of DNA and proteins around it).



# Dietary interventions for healthy aging: where are we heading?

**Rafael de Cabo**

Translational Gerontology Branch, National Institute on Aging (NIA),  
Baltimore, USA

Aging is an intrinsic feature of life and the major driving force behind most chronic diseases. The manipulation of aging to extend lifespan has intrigued scientists and created deep controversies in all fields of research.

Recent evidence is shaping a picture that there are multiple strategies to prolong health and survival in laboratory animals. Our understanding on dietary interventions, calorie restriction (CR), and its mimetics have provided novel targets to further our understanding of the underlying mechanisms of aging.

The calorie restriction paradigm has provided one of the most widely used and most useful tools for investigating mechanisms of aging and longevity. By far, rodent models have been employed most often in these endeavors. Over decades of investigation, claims have been made that the paradigm produces the most robust demonstration that aging is malleable.

I will be discussing results on emerging data that questions that the universality of the response to CR and novel strategies to its potential translation to the clinic.







# Circadian rhythms, time-restricted feeding, and healthy aging

**Satchidananda Panda**

Salk Institute for Biological Studies, La Jolla, California, USA

Time-restricted feeding (TRF; 8-12 h food access in the active phase) without changing nutrient quantity or quantity improves daily oscillations in metabolic pathways and aligns them appropriately to the period of fasting or feeding.

Subjecting rodents to TRF prevents excessive weight gain, adiposity, glucose intolerance, systemic inflammation, hepatosteatosis and hypercholesterolemia independent of diet type. Rodents on TRF also show increased endurance, motor coordination, and brown fat function. When high fat diet induced obese mice or mice with genetic predisposition to obesity are subjected to TRF, they also experience similar therapeutic benefits. TRF does not alter the major gut microbiome composition, yet it modulates gut metabolism of carbohydrates and bile acids.

Unbiased assessment of the temporal changes in transcriptome, metabolome and gut microbiome revealed TRF exerts pleiotropic effect on metabolism in multiple tissue types in both rodents and insects.

To test the translational potential of TRF in humans, we have begun to monitor daily eating pattern using a novel unbiased, evidence-based, and scalable method. Preliminary data shows erratic eating pattern with extended period of frequent caloric intake events that potentially maintains a post-prandial metabolic state in humans in widespread. Time-restricted feeding without overt attempt to alter nutrition quality or quantity might be a potential new lifestyle intervention to improve human health.





# New insight in nutrigenomics

**Marco Giorgio<sup>1</sup>, Daniela Morale<sup>2</sup>**

<sup>1</sup> European Institute of Oncology (IEO), Milan, Italy

<sup>2</sup> University of Milan, Italy

Do pro-longevity plant bioactives mediate angiosperm-animal coevolution?

Angiosperms evolved different phenotypes to attract animals reverting the typical anti-herbivores defensive strategies. These phenotypes include the accumulation of bioactive compounds with minimal nutritive value in edible parts of flowers and fruits that however impact on the ecological niche of the animal.

For instance, in the floral nectar the alkaloid caffeine favours memory of reward of pollinators (Wright GA *et al.* Science. 2013. 339:1202-4), in the pollen consumed by honey bees coumaric acid improves stress resistance (Mao W *et al.* Proc Natl Acad Sci U S A. 2013. 110:8842-6), in the elaiosomes of some diaspores specific fatty acids induce myrmecochory by cheating reward signalling to the ant (Turner KM & Frederickson ME. PLoS One. 2013. 8:e71871).

A number of secondary metabolites present in flower or nectar or in fruits, such as the flavonol fisetin, the flavone apigenin, the flavanone naringenin, the anthocyanidin cyanidin, the stilbenoid resveratrol protect from aging-associated diseases, retard aging and prolong lifespan in animal models. Studies on the mechanism of actions of these compounds revealed they target in animal cells conserved molecular pathways including insulin/IGF1, AMPK/TOR, sirtuins axes involved in fitness and longevity.

Whether animal longevity is an important trait in the plant-animal coevolution is unclear. In particular, whether plant bioactive compounds that would

prevent aging diseases and increase longevity in animals are present in food by chance or on purpose to mediate angiosperms-animal mutualism is difficult to demonstrate empirically.

Coevolution trajectory can be inferred by modeling stochastic evolution.

## SESSION 2

EVIDENCE-BASED NUTRITION:  
TRIALS AND EPIDEMIOLOGY

*Chairman:* Daniele Del Rio





# Personalized medicine using gut microbiome and clinical data

**Eran Segal**

Weizmann Institute of Science, Rehovot, Israel

Accumulating evidence supports a causal role for the human gut microbiome in obesity, diabetes, metabolic disorders, cardiovascular disease, and numerous other conditions, including cancer. Here, I will present our research on the role of the human microbiome in health and disease, aimed at developing personalized medicine approaches that combine human genetics, microbiome, and nutrition.

In one project, we set out to understand personal variation in the glycemic response to food, tackling the subject of personalization of human nutrition, a poorly studied topic that is critical for human health and to billions of people predisposed to, or suffering from, obesity, T2D and related co-morbidities. We assembled a 1,000 person cohort and measured blood glucose response to > 50,000 meals, lifestyle, medical and food frequency questionnaires, blood tests, genetics, and gut microbiome. We showed that blood glucose responses to meals greatly vary between people even when consuming identical foods; devised the first algorithm for accurately predicting personalized glucose responses to food based on clinical and microbiome data; and showed that personalized diets based on our algorithm successfully balanced blood glucose levels in prediabetic individuals. These results suggest that personalized diets may successfully modify elevated postprandial blood glucose and its metabolic consequences.


I will also present our studies of the mechanisms driving recurrent post-dieting obesity in which we identified an intestinal microbiome signature that persists



after successful dieting of obese mice. This microbiome signature contributes to faster weight regain and metabolic aberrations upon re-exposure to obesity-promoting conditions and transmits the accelerated weight regain phenotype upon inter-animal transfer. These results thus highlight a possible microbiome contribution to accelerated post-dieting weight regain, and suggest that microbiome-targeting approaches may help to diagnose and treat this common disorder.

Finally, we studied the relative contribution of host genetics and environmental factors in shaping human gut microbiome composition. To this end, we examined genotype and microbiome data in over 1,000 healthy individuals from several distinct ancestral origins who share a relatively common environment, and demonstrated that the gut microbiome is not significantly associated with genetic ancestry. In contrast, we find significant similarities in the microbiome composition of genetically unrelated individuals who share a household, and show that over 20% of the gut microbiome variance can be explained via environmental factors related to diet, drugs and anthropometric measurements. We define the term biome-explainability as the variance of a host phenotype explained by the microbiome after accounting for the contribution of human genetics. Consistent with our finding that microbiome and host genetics are largely independent, we find significant biome-explainability levels of 24-36% for several human traits and disease risk factors. We also successfully replicated our results in an independent Dutch cohort.

Overall, our results suggest that human microbiome composition is dominated by environmental factors rather than by host genetics.



# Nutrition, metabolomics and cardiometabolic diseases: the PREDIMED experience

**Miguel Ruiz-Canela**

University of Navarra, Pamplona, Spain

Promoting a healthy diet is one of the most effective strategies for cardiovascular disease (CVD) and diabetes prevention.

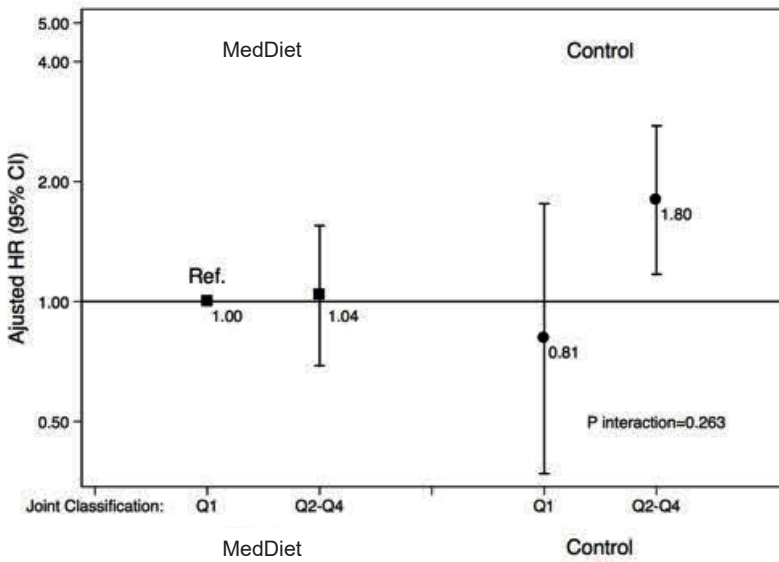
The Mediterranean Diet (MedDiet) is one of the most well-studied dietary patterns with demonstrated cardiometabolic benefits.

The PREvencion con DIeta MEDiterranea (PREDIMED) study was the first randomized primary prevention trial to show a protective effect of the MedDiet on CVD. Moreover, this study has also shown the protective effect of the MedDiet against other chronic diseases including type-2 diabetes (T2D), atrial fibrillation, peripheral artery disease and heart failure. A beneficial effect of a MedDiet would be predicted based on its ability to improve lipid levels and anti-inflammatory and antioxidant properties. Currently, the identification of metabolite profiles associated with cardiometabolic diseases is a subject of growing interest. Metabolite profiling techniques (metabolomics) are a tool for measuring the full profile of small-molecule metabolites that provides a comprehensive picture of an individual's metabolic status.

We are currently conducting several projects to identify metabolomic signatures of the risk of CVD and diabetes and to investigate whether the dietary interventions in the PREDIMED trial modify the associations between plasma metabolites and the risk of these cardiometabolic diseases.

Up to now, we have assessed the association between plasma concentrations of metabolites and the risk of CVD and T2D in a subpopulation of the PRED-

IMED study. We have found significant associations between incident CVD and plasma concentrations of several metabolite profiles including branched-chain amino acids, acylcarnitines, glutamine/glutamate, ceramides, other lipid species, and metabolites from the choline and tryptophan-kynurenine pathways. We have also shown that a MedDiet may offset the increased risk of CVD associated with high baseline concentrations of some of these metabolites (*see figure*).



The study of metabolite profiles reflect several pathophysiological processes related to inflammation, oxidative stress, and endothelial dysfunction. Moreover, it may contribute to new knowledge about mechanisms underlying diet and CVD and new statistical methods for analyzing nutritional metabolomics data.



# Evidence based nutrition perspectives and challenges

**Giuseppe Grosso**

Integrated Cancer Registry, Catania, Italy; Need for Nutrition Education/Innovation Programme (NNEdPro), Cambridge, United Kingdom

Evidence of the relation between dietary factors and human health often provided consistent results but comprehensive evaluation are still lacking. Preliminary results from our work aimed to evaluate the level of evidence of the association between individual foods and dietary patterns and disease risk.

The most consistent findings have been found for meat, fruit and vegetable intake and risk of cardio-metabolic diseases (including stroke and type 2 diabetes), and some cancers (including lung, colorectal, and breast cancer); dairy intake and decreased risk of cardiovascular diseases, hypertension, and some cancers (including colorectal and breast cancer); and fish intake and decreased risk of cardiovascular mortality, depression and some cancers (including rectal and liver cancer).

Regarding dietary patterns and cancer risk, the most convincing evidence supported an association between healthy dietary patterns and decreased risk of colon and breast cancer, especially in postmenopausal, hormone receptor-negative women, and an association between unhealthy dietary patterns and increased risk of colon cancer.

Nonetheless, potential effect modifiers have been studied to further evaluate the strength of evidence. Specifically, unhealthy dietary patterns have been found to be associated with higher BMI, while healthy patterns were associated with higher education, physical activity, and less smoking.

Moreover, we reported that BMI, educational, and smoking status are associated in a linear manner with level of meat, fruit and vegetable consumption in existing cohorts. Thus, the role of potential effect modifiers has to be further investigated.



# Fasting is the new nutrition therapy?

**Andreas Michalsen**

Internal and Integrative Medicine, Charité University Medical Center, Berlin, Germany

An increasing body of evidence from experimental research points to the beneficial preventive and therapeutic effects of fasting and caloric restriction for the main chronic diseases, e.g. cardiovascular, inflammatory, neurodegenerative and metabolic diseases. More recently, fasting regimens have been also proposed as a promising preventive measure or add-on treatment in oncology.

According to surveys about 4 million people practice periodic fasting in Germany regularly for preventive purpose. Within the concept of clinical Integrative Medicine, fasting has a longstanding tradition in Central Europe with specialized fasting clinics and specialized fasting wards in hospitals.

Evidence from clinical studies is increasing but still preliminary in the major indications. Four clinical studies and a systematic review underline the benefit of periodic fasting in the treatment of rheumatoid arthritis. Several larger uncontrolled studies and some smaller randomized studies indicate the effectiveness of periodic fasting in hypertension and diabetes type-2.

Furthermore, we and others found a mood-enhancing, antidepressive and generally pain-relieving effect of fasting. More recently two small randomized pilot trials and a currently finished own small randomized trial point to a beneficial effect of fasting during chemotherapy with reduction of adverse effects and increase of quality of life. Fasting-mimicking diets (FMDs) have shown effectiveness in first randomized trials for cardiovascular and metabolic risk reduction in healthy subjects and for improvement of quality of life in patients

with multiple sclerosis. Concomitantly, first randomized trials have evaluated different concepts of intermittent fasting and time-restricted eating and have more or less consistently indicated beneficial effects on chronic disease and risk profiles.

In our own experience of > 20.000 patients that performed periodic fasting, the intervention appears safe and generally feasible. However, interactions with medications may occur and there are some defined contraindications to fasting.

In the presentation protocols and first data from ongoing larger clinical trials and observational studies on periodic and intermittent fasting will be presented.

# Biographies

## Scientific committee

### **Silvia Misiti**

Silvia Misiti MD PhD, from 2001 Assistant Professor in Endocrinology at Sapienza University of Rome, Italy. In 2012 she moved to Lugano, Switzerland, where she directs the IBSA Foundation for scientific research, a non-profit organization, created by the pharmaceutical company IBSA, Institute Biochimique SA. Her mission is to combine the passion for scientific research with the promotion of multiple activities always focused on innovation, education and dissemination, through close contacts with the cultural and academic institutions, to keep a wide look on what research offers us today to overcome the frontier of knowledge. She currently is, also, Head of Corporate Communication & CSR at IBSA SA.

### **Lucilla Titta**

Lucilla Titta, PhD, researcher in nutrition science, scientist and consultant at the Department of Experimental Oncology of the European Institute of Oncology (IEO) in Milan, Italy. She coordinates the SmartFood project, a research program in nutrition and communication sciences promoted by the IEO. Since 2015 she is technical and scientific advisor for the Food Bank in Oncology project in collaboration with Fondazione Tera. She is also consultant, as an expert in nutrition and nutrition education, for numerous public and private institutions. Speaker at national and international conferences, she is also author of numerous scientific and dissemination publications; in particular the book *The SmartFood Diet*, published by Rizzoli in 2016, is a bestseller translated in 10 languages and sold in 20 different countries. Since 2010 she carries out an intense scientific dissemination activity, collaborating with various newspapers, radio and TV.

## Chairmen

### **Maria Rescigno**

Maria Rescigno graduated in Biology in 1990 at the University of Milan, Italy. From 1991 to 1994 she worked at the University of Cambridge, UK, as a visiting scholar.



In 1999 she received her PhD in Pharmacology and Toxicology. From 1999 to 2001 she worked at the University of Milano-Bicocca where she specialized in Applied Biotechnology. Since 2001 she is Director of the Dendritic Cell Biology and Immunotherapy Unit at the Department of Experimental Oncology at the European Institute of Oncology (IEO). She was the first to show that dendritic cells actively participate to bacterial uptake in the gut and the existence of a gut vascular barrier that resembles the blood brain barrier. She authored more than 130 publications in high impact journals. In 2007 she was nominated EMBO young investigator. In 2008-2013 she was Visiting Professor at the University of Oslo. In 2011 she was elected EMBO member. She has been the recipient of three ERC grants. In 2016 she founded Postbiotica s.r.l., a spin-off of the University of Milan that exploits microbiota-derived metabolites as new pharmaceutical agents. From 2018 she is Full Professor at Humanitas University and group leader at Humanitas Research Hospital, Milan.

### **Daniele Del Rio**

Daniele Del Rio is Associate Professor of Human Nutrition at the University of Parma, Italy, and Scientific Director of the NNEdPro Global Centre for Nutrition & Health, in Cambridge, UK. He serves as Editor in Chief of the “International Journal of Food Sciences and Nutrition”. He is a proud Knight Commander of the Italian Republic for scientific achievements. He is growing a team of brilliant scientists, working on the effects of plant foods on human health. He is also a founding council member of the University of Parma School of Advanced Studies on Food and Nutrition, a state of the art research and teaching institution in the field of food science and nutrition.

## **Speakers**

### **Rafael de Cabo**

Chief of the Translational Gerontology Branch at the National Institute on Aging, a division of the U.S. National Institutes of Health. He heads the Aging, Metabolism, and Nutrition Unit (AMNU) that 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.

## **Marco Giorgio**

Senior Researcher at the Department of Experimental at the European Institute of Oncology, Milan. He has worked on the creation and exposition of many transgenic models for the study of mammals' genes involved in the control of cell processes. In particular, his work has been crucial in generating the first transgenic model for mammals (p66Shc<sup>-/-</sup>) that features an extended life span and in the clarification of the mechanism of action of the p66Shc gene.

## **Giuseppe Grosso**

Research Fellow at the Integrated Cancer Registry, AOU Policlinico Vittorio Emanuele, University of Catania and at the NNEdPro Global Centre for Nutrition and Health, St. John's Innovation Centre, Cambridge.

His research focuses on impact of dietary and lifestyle habits on common non-communicable diseases, such as cardiovascular and metabolic disease, cancer, and depression. In particular, he has experience in evaluating the effects of dietary pattern (i.e., Mediterranean diet) and specific antioxidant-rich foods (i.e., coffee, tea) as well as individual antioxidants on non-communicable diseases. He conducted his research on cohorts of individuals in both Mediterranean and non-Mediterranean countries. He is also interested in evidence synthesis to generate policy-oriented research in the area of food and nutrition.

## **Andreas Michalsen**

Professor of Clinical Complementary Medicine at the Charité University Medical Centre Berlin and Head of the Department of Internal and Complementary Medicine at Immanuel Hospital Berlin. Clinically and scientifically, Michalsen focuses on mind-body-medicine (meditation, yoga, stress reduction), nutritional medicine and therapeutic fasting as well as purging methods. In cooperation with his team, he conducts research into the efficacy of Ayurveda. He is author of many scientific publications on mind-body medicine, yoga, meditation, nutrition, fasting, health-promoting lifestyle and evidence-based naturopathy.

## **Satchidananda Panda**

Professor at the Salk Institute, La Jolla, California, where his research focuses on the circadian regulation of behavior, physiology and metabolism in model organisms and in humans. Recently he discovered that maintaining a daily feeding-fasting cycle – popularly known as Time-restricted feeding (TRF) – can prevent and reverse

metabolic diseases. Based on a feasibility study in humans, his lab is currently carrying out a smartphone based study to assess the extent of circadian disruption among adults.

### **Pier Giuseppe Pelicci**


Director of the Department of Experimental Oncology at the European Institute of Oncology (IEO) in Milan. His studies focus essentially on the genetics of leukemia and breast cancer. His laboratory is also studying the effects of metabolism and specific checkpoint activation on tissue homeostasis, aging and cancer risk (novel signalling pathway involving p53, p66Shc and reactive oxygen species, risk factors such as overweight and obesity). He is member of different national and international societies, and was honoured with a number of prestigious awards (including several international prizes).

### **Miguel Ruiz-Canela**

Associate Professor of Public Health and Preventive Medicine. His epidemiological research has been focused on the effect of nutrition on several chronic diseases, mainly cardiovascular disease, obesity and depression. He has worked with the SUN cohort and the PREDIMED randomized trial. Both studies aimed to assess the efficacy of the Mediterranean diet in the primary prevention of cardiovascular diseases. He is currently a co-investigator at the PREDIMED-plus study and he is coordinating some research activities between the University of Navarra and the University of Harvard on two projects about metabolomics, cardiovascular disease and diabetes. Additionally he is PI of a new secondary prevention trial of atrial fibrillation with Mediterranean Diet (PREDIMAR study).

### **Eran Segal**

Associate Professor at the Department of Computer Science and Applied Mathematics at the Weizmann Institute of Science, heading a lab with a multi-disciplinary team of computational biologists and experimental scientists in the area of Computational and Systems biology. His group has extensive experience in machine learning, computational biology, probabilistic models, and analysis of heterogeneous high-throughput genomic data from various technologies such as next-generation sequencing. His research focuses on developing quantitative models for all levels of gene regulation, including transcription, chromatin, and translation; and studying the relationship between nutrition, health, and gut microbes in human individuals.



The food choices we make every day have a significant impact on our health status and life expectancy. Ultimately, scientific progresses in genomics reveal opportunities in order to better understand the relationship between diet, disease risk, and health.

“The new nutrition era: from molecular mechanisms to human health” is the theme of the XIII Forum organized by IBSA Foundation. The Forum brings together internationally renowned experts to discuss existing knowledge and advances in the molecular mechanisms of metabolism of chronic diseases and aging and their relation to human nutrition.