

Conference Report

# Preface and Abstracts of the 2nd International One Health Conference <sup>†</sup>

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**Abstract:** The International One Health Conference 2023, scheduled for October in Barcelona, fosters a collaborative, multidisciplinary approach to health involving professionals, academics, and decision-makers. Operating in a hybrid format, the conference aims to bridge the gap between scientific knowledge and policies, aligning with the Sustainable Development Goals (SDGs) and Health in All Policies (HiAP). Emphasizing community involvement and the symbiotic relationship between basic needs, sustainable lifestyles, and empowerment, the conference envisions a comprehensive approach to sustainable development. D’Alisa introduces a framework incorporating participative democracy, recognizing the interconnectedness of economic, social, environmental, and participative democratic dimensions. Framing questions for the conference delve into critical aspects, addressing the integration of the One Health framework within health sectors, emphasizing interlinkages between health, climate change, and decision-making. The conference’s five-dimension framework tackles the complexity of One Health, addressing concerns, solutions, and opportunities in a holistic paradigm.

**Keywords:** One Health; eco-anxiety; five-dimension framework; eco-hope

## 1. Introduction

In our modern society, addressing health requires a collaborative, multidisciplinary effort involving professionals, academics, and decision-makers.

The International One Health Conference 2023, scheduled for October in Barcelona, adopted a hybrid format, facilitating the exchange of experiences and discussions on systemic approaches to One Health. The conference aims to bridge the gap between scientific knowledge and policies, emphasizing the transformation of science into impactful policies. Exploring frameworks such as Health in All Policies (HiAP) [1], which systematically considers health implications in decision-making, the conference aligns with the Sustainable Development Goals (SDG) framework, particularly at the urban level. HiAP [2] becomes a crucial tool in improving population health and equity.

By fostering dialogue and collaboration, the conference seeks to contribute to a more comprehensive and effective systemic approach to managing both urban and natural resources for the betterment of public health.

The Lancet Countdown Report [3] underscores climate, pollution, and biodiversity crises' interconnectedness, emphasizing transformative action. The International One-Health Conference 2023 aligns with this, advocating for integrated approaches echoing Agenda 2030. Moreover, The Budapest Declaration, adopted at the 7th Ministerial Conference on Environment and Health, highlights persistent environmental risks causing 1.4 million annual deaths just in Europe [4]. Addressing climate change indeed necessitates forging partnerships and implementing impactful policies at the city level, specifically targeting the energy, transport, and food domains.

Sustainability has evolved into a pivotal concept in modern policies, seamlessly integrating into the framework of the Sustainable Development Goals (SDGs) since the Rio + 20 conference. For sustainable development to thrive, community involvement in environmental management at the local level is paramount. Local communities possess intimate knowledge of environmental priorities and challenges, even if certain issues surpass their immediate capacity for resolution. Sustainable development, in essence, results from a symbiotic relationship between meeting basic needs and sustaining lifestyles while considering the empowerment of individuals and communities. This synergy manifests in environmental conservation and optimal resource utilization. The interconnected nature of these concepts should be perceived not as a linear cause–effect relationship but as interdependencies in a circular paradigm. Beyond environmental concerns, sustainable development encompasses a human dimension. Social issues within communities are integral components of a comprehensive sustainable development approach, dispelling the notion of separation. This holistic perspective envisions sustainable development as the convergence of economic, social, and environmental sectors, commonly known as dimensions. Acknowledging the interdependence of economic, social, and environmental systems challenges the idea of their independence. D'Alisa [5] introduces a comprehensive framework incorporating participative democracy as a fourth dimension, situated within the social dimension, and intersecting with the economic dimension. This inclusivity recognizes the role of economic decisions, consumption choices, and public institutions in the participatory planning of strategies, emphasizing the interconnectedness of economic, social, environmental, and participative democratic dimensions for a truly effective strategy of sustainable development.

### 1.1. Framing Questions

Scientific contribution for the conference was achieved by asking authors to possibly respond to specific framing questions regarding the field of One Health.

The framing questions of the conference delved into critical aspects, tackling the integration of the One Health framework within health sectors. The goal was to extend the discourse to the essential interlinkages between health, climate change, and decision-making, probing the concerns and understanding among health professionals regarding the One Health concept:

- How can the One Health framework be included in the health sector?
- What are the big open questions? And what are the different understandings?

- The missing link between science policy and implementation: understanding inter-linkages between health, climate change, and decision-making.
- What are the concerns and understanding about the One Health concept among health professionals?
- What are the possible solutions to overcome the barriers of its introduction? And what are the opportunities?

1.2. Conference Domains

The conference welcomed contributions inside a five-dimension framework.

This framework has been designed to tackle the complex and multifaceted aspect of One Health. Table 1 presents the main areas of interest of each domain that are also graphically rendered in Figure 1.

**Table 1.** Description of each dimension of the framework.

Dimension Name	Description	Topics
Environmental	Environments cover the abiotic (e.g., soil, water, air, and chemicals) aspects of defined geographic areas. Ecosystems involve the biotic (e.g., microbial, flora, and fauna) interactions within defined geographic areas. Environments and ecosystems can be indoors, inside buildings and structures, or outdoors in urban, suburban, rural, or undeveloped natural settings.	Nature-based solution, green industries and decarbonization, antimicrobial resistance, infectivology, epigenetics, health and climate change, and nanotoxicology.
Digital	Digital health, stemming from the evolution of eHealth and connected healthcare, blends engineering and medicine to enhance efficiency, precision, and personalization in health. The One Digital Health [6] paradigm integrates human, veterinary, and environmental data, fostering targeted interventions for holistic well-being.	Artificial intelligence (digital health, IoT environmental health forecast), big data analytics, health forecast, digital tools for healthier communities, One Digital Health, and citizen science tools to monitor and prevent.
Social	The health of communities is intricately linked to broader social issues, particularly climate justice. Achieving truly healthy societies requires justice and equality. Social factors, encompassing cultural, religious, and educational aspects, along with negative influences such as corruption and prejudice, significantly impact community health. Recognized as a fundamental human right in international declarations and conventions, the right to health necessitates addressing social factors, especially for vulnerable populations, underlining the interconnectedness of health and social justice.	Health and climate migration, environmental health applied to the war, health and human rights (women leadership in environment and health), and rights of nature and animals.
Policy/Econometrics	Bridging the gap on implementation requires a strong dialogue between science and policy. The focus is on connecting academia with decision-makers using frameworks such as the SDGs and HiAP, emphasizing metrics and innovative proposals to integrate scientific data into impactful policies.	Economic factors could include corporate interests and income, employment rates, poverty rates, healthcare access, and availability rates.
Participatory	Real implementation requires active participation, and long-term compliance necessitates engagement from stakeholders and citizens. Focusing on the participative aspect of One Health, the approach follows the “leave no one behind” principle, addressing inequalities and vulnerabilities. A proposed participatory inquiry on eco-anxiety aims to assess and collaborate with the KOSMA Observatory for a holistic One Health approach.	Healthy cities, eco-anxiety, and One Health in vulnerable communities.



**Figure 1.** The five-dimension framework of the 2nd International One Health Conference.

In conclusion, the conference has proposed One Health, as a dynamic framework, to call upon a new green renaissance addressing the interplay between the health of humans, animals, plants, and the environment.

For this purpose, the One Health community's openness to innovative ideas and commitment to understanding the entire system's health are vital for fostering optimism and resilience in our collective environmental efforts.

Such an approach allows us to transition from eco-anxiety to eco-hope, embracing a holistic One Health approach, breaking down silos between human, animal, and ecosystem health, and fostering collaboration and understanding across disciplines to empower us to face common environmental challenges.

## 2. Keynote Speeches

### 2.1. Study of Malaria Morbi-Mortality Variation Associated with Climate Change from 2010 to 2019 in Niger

**Giovenale Moirano**

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In the past decades, epidemiological and public health research has primarily focused on proximal health risk factors, investigating whether behavioral, genetic, occupational, or local environmental exposures can increase the individual risk of experiencing health outcomes. However, the world has been undergoing significant environmental and sociodemographic transformations—such as climate change, biodiversity loss, water and air pollution, and demographic shifts—highlighting the role of distal determinants in shaping health outcomes. Emerging evidence suggests that population health is shaped by this complex relationship between distal and proximal factors. The concepts of Planetary and One Health offer robust methods and frameworks for comprehending these complexities. This presentation will explore current applications of Planetary and One Health methodologies in monitoring, researching, and safeguarding population health during an era of profound change. It will also address the challenges faced and outline future perspectives.

### 2.2. Study of Malaria Morbi-Mortality Variation Associated with Climate Change from 2010 to 2019 in Niger

**Amina Benyahia**

Head a.i. WHO One Health Initiative, Geneva, Switzerland; [benyahiaa@who.int](mailto:benyahiaa@who.int)

The intervention has explored the WHO's pivotal role in the One Health initiative, serving as the Secretariat for the High-Level Expert Panel and collaborating with FAO,

UNEP, and WOAAH. The initiative focuses on advancing a robust One Health research agenda and deploying cross-sectoral solutions to bolster regions and countries. Primary objectives include revitalizing the One Health approach to diminish people's vulnerability to health emergencies and enhance overall well-being. Furthermore, the initiative seeks to broaden the One Health perspective by incorporating environmental elements, such as changes in land use and urbanized ecosystems, into the human–animal interface approach. The speech underscores the interconnectedness of human, animal, and ecosystem health, emphasizing a holistic approach to comprehensively address global challenges. Through these concerted efforts, the initiative aims to build resilient systems that can effectively respond to complex health and environmental dynamics, fostering a healthier and safer world for all.

### *2.3. Transforming Our World from the Silent Spring: The Care for Our Common Home*

#### **Marcella Trombetta**

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In 1897, Paul Gauguin in his paint, “Where do we come from? Who are we? Where do we go?” (D’où venons-nous? Que sommes-nous? Où allons-nous?), represented his spiritual testament by depicting the cycle of life within a Polynesian paradise. The intervention responded to these three questions regarding the history and the evolution of the One Health approach in a journey that starts from the past and projects us into the future, with the desire to transform our world from the silent spring of the 1960s, taking care of our common home.

### *2.4. Microplastic: Environment Contamination and Human Health Implications*

#### **Mohamed Banni**

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The ubiquitous distribution of environmental microplastics (EMPs) in our environment raises global concern to understand their impact. The body of knowledge regarding their accumulation and biological effects in biological systems is still significantly limited. Microplastics (MPs) also include nanoplastics (NP), which have diameters less than 0.1  $\mu\text{m}$  (100 nm). Due to their small size, MPs can be potentially dangerous as they can be easily absorbed by body tissues and organs. Humans are exposed to environmental microplastics (MPs) that can be frequent in the surrounding environment. Indeed, recent studies have demonstrated the presence of plastic particles in human blood as well as in the placentas, providing strong evidence for the occurrence of plastic contamination in the human body.

Unfortunately, little is known about the long-term effects of this type of contamination on both ecosystems and human health. However, everything indicates that there is an urgency to take mitigation and protection measures against this type of contamination.

### *2.5. Mammals and Humans: From Lab Animals to the One Health Approach: the example of Ozonized Oils*

#### **Alberto Izzotti**

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The work discussed the use of ozonized oils in the treatment of diseases in both animals and humans, highlighting the effectiveness of a holistic “One Health” approach. The work presents examples of successful treatment of conditions such as Leishmaniasis in dogs and cats, as well as cancer in various animal models. The research demonstrates the potential of ozonized oils in activating apoptosis in cancer cells and inhibiting macrophage activation. Additionally, it emphasizes the importance of addressing oxidative stress in

diseases, particularly in the context of Leishmania infection. The use of ozonized oils also has antioxidant properties and impacts on cellular oxidation.

#### *2.6. From Micro to Macro: One Health in Ecosystems Nature-Based Approaches, and the Urban Environment*

##### **Amaia Celaya Alvarez**

Resilience Advisor, United Nations International Organization for Migration (UN-IOM) and European Commission, Geneva, Switzerland; amaia.celaya@abar.es

Cities have the potential to be health and well-being engines, climate-crisis-adaptive mechanisms, and innovative motors of new policies that will shape the behavior of millions of people and decrease further exposure to environmental contaminants.

The health and well-being of its citizens are one of a city's most important assets and responsibilities. Following the WHO Urban Health Initiative (UHI), cities are called to act against urban pollution, leveraging the urban environment as a tool to promote physical and mental health. Urban environments provide livelihoods, infrastructures, services, access to health, education, information, vibrant cultural exchanges, and more. However, these environments can also worsen health risks and provoke new shocks and stresses in the intersection with other sectors, such as land use design and planning, water, energy, waste and resources, natural environment, logistics, infrastructure, or housing.

Extremely hot and cold episodes, urban heat island effects, lack of access to walking pathways and bike lanes, and green infrastructures unfairly distributed within urban space, in addition to the wide availability of tobacco, alcohol, and unhealthy foods and beverages, drive the so-called non-communicable diseases (NCD) epidemic. The Global Alliance for Chronic Diseases (GACD) advocates for interventions in cities to reduce the risk of NCDs, since lowering the burden of NCDs is crucial to building resilient and healthy societies.

#### *2.7. From Micro to Macro: Healthy and Sustainable Diets*

##### **Anna Bach Faig**

Professor, Director Msc Food, Health, and Sustainability at Universitat Oberta Catalunya, Barcelona, Spain; abachf@uoc.edu

Sustainable healthy diets prioritize health promotion, environmental impact reduction, accessibility, affordability, safety, and cultural acceptance. Research has examined the ecological footprint of food systems in the EU-27, revealing the strain on regional biocapacity from 2004 to 2014 due to food consumption and dependence on external sources. This highlights the need for transformative food system changes to align with planetary health goals.

Within the Mediterranean context, the Mediterranean diet (MD) stands out as a potential model for adopting healthier and more sustainable eating patterns. A recent systematic review assessed the MD's sustainability in terms of carbon footprint, water footprint, land use, and energy use. Among the thirty-five studies analyzed, 91% deemed the MD sustainable, with 9% considering it less sustainable compared to plant-based or other diets.

To address these challenges, systemic policies integrating nutritional and sustainability aspects are crucial. Solutions involve scrutinizing food origins and animal protein sources, combatting food waste, and emphasizing plant-based dietary choices.

#### *2.8. The Project OneAquaHealth*

##### **Maria João Feio**

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The project OneAquaHealth (Horizon Europe, GA 101086521) aims to demonstrate that the health of freshwater ecosystems and human health and well-being in urban contexts are highly interconnected, and that improving one results in the improvement of the other,

re-establishing the balance between nature and humans. In OneAquaHealth, 13 partners from 10 countries will develop an Environmental Surveillance System composed of several digital tools to monitor urban stream ecosystems' health and predict disease outbreak risks, as well as providing solutions to improve them. To achieve that, the partners are: (i) identifying the level of integrity of urban aquatic ecosystems, which allows for the maintenance of human health and well-being, and animal and plant health, (ii) determining early-warning indicators to assess ecosystem health, (iii) integrating live Earth observation data to monitor those indicators, and (iv) using citizen science and participatory research to engage the civil society and decision-makers in the data collection and recovery of urban stream ecosystems.

### *2.9. Eco-Epidemiological Intelligence for Early Warning and Response to Mosquito-Borne Disease Risk in Endemic and Emergence Settings (E4Warning)*

**Frederic Bartumeus**

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E4Warning embodies a comprehensive strategy aimed at enhancing our comprehension of the dynamic interactions among humans, mosquitoes, reservoir species, and the environment. This initiative seeks to enhance disease surveillance capabilities, enabling early detection and prediction of mosquito-borne disease outbreaks. Diseases like dengue, Zika, chikungunya, and West Nile fever are increasingly prevalent worldwide due to factors like climate change and globalization. Dengue alone affects an estimated 390 million individuals annually, causing up to 36,000 fatalities. While these diseases primarily afflict tropical and subtropical regions, rising instances of indigenous cases in European nations since 2010 highlight the potential for pathogen establishment in temperate zones. To tackle the intricate nature of mosquito-borne diseases (MBDs), the E4Warning consortium comprises a diverse and innovative team representing 12 organizations across Spain, Germany, Greece, Belgium, Switzerland, and the United Kingdom. This interdisciplinary group boasts expertise in entomology, movement ecology, epidemiology, Earth observation science, sensor engineering, socio-demography, and spatial statistical modeling.

### *2.10. Unveiling Lessons from Health Movements for a Robust One Health Future*

**Marco Manca**

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One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. As such, One Health carries huge expectations about its potential impact as a catalyst of sustainable development. However, there are some hard lessons that can be learnt from previous movements of similar ethos, which ultimately failed to induce substantial change in our societies. A relevant example could be Health in All Policies, which proposed the pragmatic approach that every new policy should be evaluated against its potential/actual impact on health, no matter how indirectly it would be exerted. What made it fail and disappear from public conscience? And can similar gaps be identified for the One Health movement? Starting from social- and health-care settings, we will offer a reality check on policy-making and practices, hoping to arm the listener against traps that would be "unknown knowns".

### *2.11. Role of Scientific Societies and SESA Line of Work Linked to One Health*

**Carolina María Sánchez Peña**

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The Spanish Society of Environmental Health arose with the purpose of improving people's health through its protection against the risks present in the environment. Among its main functions is to serve as a forum to bring together natural or legal persons whose professional or scientific activities are carried out in the field of environmental health, in order to promote the exchange of knowledge about it in the fields of research, management,

personnel training, or any other that contributes to the promotion, development, and dissemination of environmental health. Another relevant aspect to point out is the multidisciplinary nature of the professionals that constitute it and the multisectorality that they represent. For all of the above, the Spanish Society of Environmental Health plays a fundamental role in the coordination of projects and plans that require a One Health approach.

#### 2.12. *Health and Environment Strategic Plan 2022–2026*

##### **Irene Corbella Cordomí**

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The One Health approach is a cross-cutting axis of the Health and Environment Strategic Plan 2022–2026, developed by the Ministry of Health of Spain in coordination with the Ministry for Ecological Transition and Demographic Challenge, involving multidisciplinary participation.

It serves as an important management tool for addressing major environmental challenges from the perspective of human health. It focuses on safeguarding against exposure to environmental risks that impact population health, with particular attention to the most vulnerable populations.

The majority of actions in the 2022–2023 Plan are related to water and air quality, electromagnetic fields, and climate risks. Additionally, there are notable cross-cutting efforts concerning health impact assessment and the creation of informative materials regarding environmental health risks for the general population and professionals.

The Plan promotes a holistic view of health and facilitates the evaluation of the state of environmental health.

#### 2.13. *SOCSA—Societat Catalana de Salut Ambiental*

##### **Carmen Ruiz Martin**

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The place that SOCSA occupies within the concept of One Health is to help generate global changes through intervention in the promotion, prevention, diagnosis, and treatment of human health. We focus on clinical ecology, taking into account this interrelation and interdependence and all the factors involved in health, raising awareness and training health professionals and those from other related disciplines, and disseminating and educating the community about this knowledge of scientific evidence transferred to sustainable and healthy lifestyles and consumption. In this way, by taking care of our health, we take care of our environment, thus preserving health in its multiple, totally interrelated and interdependent receptors. By supporting and interacting with global multi-sector and multi-agency actions, we can expedite the intervention process for healthy sustainable development.

#### 2.14. *Brain Capital, Encompassing Both Brain Health and Skills, Is a Pivotal Driver of a Well-Being Economy*

##### **Rym Ayadi**

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Brain capital, encompassing both brain health and skills, is a pivotal driver of a well-being economy.

A healthy population experiences lower stress levels, reduced healthcare costs, and enhanced overall well-being. Mental health and cognitive fitness lead to happier, more productive lives. A skilled workforce is essential for innovation and adaptability. Strong cognitive abilities foster creativity, critical thinking, and problem-solving, enabling individuals to excel in a rapidly changing job market.

Together, these aspects create a positive feedback loop. Well-being drives economic productivity, as healthy and skilled individuals are more engaged and innovative. In turn, a thriving economy can invest in better healthcare, education, and social services,

further enhancing well-being. A well-being economy recognizes that the goal is not just wealth accumulation but also the overall quality of life for its citizens. By nurturing and maximizing brain capital, nations can create a virtuous cycle where economic success and well-being reinforce each other, ultimately leading to a more prosperous and content society.

#### *2.15. Harmony beyond Health: Integrating One Welfare for a Comprehensive One Health Future*

##### **Manel Lopez-Bejar**

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The One Health approach has gained considerable traction for its emphasis on the interconnectedness of human, animal, and environmental health. However, it often overlooks the equally significant concept of One Welfare, which extends this interdependence to encompass the emotional and psychological well-being of animals, ecosystems, and humans. The objective of this talk is to assert the indispensability of integrating One Welfare into One Health policies and practices. Animal welfare is not merely an ethical obligation but a critical element in the One Health paradigm. Neglecting animal welfare can lead to increased disease transmission, reduce the efficacy of medical treatments, and compromise public health measures. By adopting a One Welfare perspective, we can more effectively combat zoonotic diseases, improve mental health, and contribute to sustainable agriculture and farming. Examples of successful integration include welfare-oriented veterinary practices, and interdisciplinary approaches that synergize veterinary medicine, human medicine, and environmental science. We will conclude by emphasizing the urgent need for policy-makers, healthcare providers, veterinarians, and scientists to collaborate in making One Welfare a compulsory component of One Health initiatives. Failure to do so undermines the holistic approach necessary for addressing the complex health challenges of our increasingly interconnected world.

#### *2.16. From Wildlife Crime in Africa to Terrorist Attacks in Europe: What Is the Connection?*

##### **Núria Querol**

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Plants and animals play a crucial role in preserving the health and balance of our planet. The delicate balance of our ecosystems hinges on biodiversity, rendering wildlife crimes a significant threat. Whether it involves the poaching of elephants for their valuable ivory or the illegal trafficking of endangered plant species, these crimes frequently cross national borders and need a global approach. The illicit wildlife trade is estimated to be worth up to USD 20 billion annually, according to a UNEP-INTERPOL report. The exploitation of the natural world by organized crime and terrorist groups touches every stage of the supply chain, from initial poaching to final sales. Moreover, these wildlife-related crimes often intersect with other illegal activities, such as money laundering, human trafficking, corruption, document forgery, and funding terrorist activities. In fact, some attacks in Europe are suspected to have been financed through proceeds from ivory trafficking.

#### *2.17. Illegal Trafficking of Species in Spain: Case by Case*

##### **Raul Mérida Gordillo**

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Illegal trafficking of species is an illegal business, and animal abuse is much more frequent than what is known in Spain. We are going to present, case by case, some of the most important and frequent events that I have known in Spain and in which I have participated by rescuing their protagonists. All of them are real cases of lions, tigers, raccoons, or primates that lived in the strangest and closest places that one can imagine, from a nightclub in Valencia, to a garbage dump in Alicante or a gas station in Galicia.

Furthermore, the illegal trafficking of species is closely linked to the presence of invasive species. We are going to explain in what way and how the fashion in the possession of some animals had a decisive impact on the current situation. In the end, man builds his future with his present actions and that future is based on the recognition of errors as an opportunity for improvement. Our attitude toward animals is like a boomerang that hits us again and again. Everything is related: whoever protects animals protects people, and the health of animals is the health of people because health and well-being is everyone's business.

#### *2.18. One Health Programs in Milan Innovation District*

##### **Giuseppe Banfi**

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Milan Innovation District (MIND) is a new city devoted to science, medicine, academia, and companies, particularly devoted to life sciences. The district was developed in the former area of universal exposition of 2015, and now there is a research and teaching hospital, Galeazzi-Sant' Ambrogio, a national center for genomics, Human Technopole, many industries connected together thanks to the so-called Federated Innovation, a center for promoting spinoffs and innovation, Skydeck from the University of Berkeley, and the Campus for Scientific Faculties of University of Milan is starting. There are many initiatives in the MIND concerning the One Health methodology: the MIND education project to develop a specific culture for students, citizen science projects devoted particularly to studying diet and physical exercise of inhabitants of the site, and evaluation of some disruptors, such as microplastics. The MIND will strictly follow the concept of One Health to propose a model for the environment and cities of the whole country.

#### *2.19. Metabolism of Cities Living Lab @ SDSU: Vulnerable Communities and SDGs along the US–Mexico Border*

##### **Dr. Gabriela Fernandez**

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The Metabolism of Cities Living Lab (MOC-LLAB) is a multidisciplinary community with professionals from around the world sourcing innovative approaches to addressing some of the world's largest challenges: climate change, health, and inequality. Since its inception in 2019, at San Diego State University (San Diego, CA, USA) under the Center for Human Dynamics in the Mobile Age, the Lab has organized workshops/seminars, bilingual art virtual/physical exhibitions, and published and developed tools (dashboards, educational campaigns, and apps) around the world on sustainable development and climate adaptation. The MOC-LLAB is currently working with the Universidad Autónoma de Baja California (Mexico) to work on projects along the US–Mexico border, with the aim to localize the UN SDGs exploring the cities of San Diego, CA; Imperial, CA; Tijuana, Mexico, and Mexicali, Mexico as Lab testing grounds. Climate change knows no borders; thus, it is important that decision-makers start highlighting and sharing the impact of climate change along the US–Mexico border through storytelling and tailored solutions. This is why professionals at MOC-LLAB prioritized underserved communities that may be disproportionately impacted by environmental risks. Climate change is affecting vulnerable communities along the border region, and the numbers seem to increase as time continues through devastation, climate crisis, policy, war, migration, and extreme weather events, among others. Researchers at MOC-LLAB aim to identify possible future impacts based on current trends and make a series of recommendations that the federal government can take in concert with state, local, and tribal governments, as well as partners in the private sector, to mitigate and adapt to climate change along the southern US–Mexico border.

### 3. Oral Session

#### 3.1. Development of an Innovative Prototype to Reduce Microplastics Pollution in Wastewater

**Eloise Pulvirenti**<sup>1</sup>, **Gea Oliveri Conti**<sup>1</sup>, **Paola Rapisarda**<sup>1</sup>, **Maria Castrogiovanni**<sup>1</sup>, **Antonio Cristaldi**<sup>1</sup>, **Luciano Falqui**<sup>2</sup> and **Margherita Ferrante**<sup>1</sup>

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Microplastics and nanoplastics (MPs and NPs) are emerging contaminants, and MPs cause damage to the whole ecosystem and to human health. Wastewater treatment plants partially manage MPs from wastewater, although the filtration systems used are not able to retain MPs under a few hundred  $\mu\text{m}$ . The ambitious goal of the “ACQUAPLANET” project is to validate a new technological system capable of reducing the release of MP particles from 10 to 150  $\mu\text{m}$ . The prototype was designed by Plastica Alfa S. P. A., and it was applied to urban wastewater. The effectiveness of the treatment is evaluated by applying the Italian patent No. 102018000003337-7 March 2018, and via relative determination in scanning electron microscopy (SEM) coupled to the EDX detector. The efficiency analysis of the filter was performed through the use of standards, with subsequent counting under the optical microscope to verify the effectiveness of the filter. The analyses carried out showed that the MPs > 10  $\mu\text{m}$  in the output samples had a concentration of  $1.05 \times 10^2$ . The prototype that is being developed has reduced the output of MPs by 90%. The filters analyzed are two types of biochar filters, the development of which is in the patenting phase. The results will make it possible to raise the TRL of the prototype from 4 to 7 to improve the quality of the water and the territory. The filter prototypes will allow for developing a new technological system that will reduce the risk of MPs pollution and improve environmental and public health conditions.

#### 3.2. Microplastics Exposure in Dialysis Patients: Preliminary Results of a Case-Control Study

**Claudia Favara**<sup>1</sup>, **Margherita Ferrante**<sup>1</sup>, **Pasquale Mario Fatuzzo**<sup>2</sup>, **Luca Maria Zanolì**<sup>2</sup>, **Paola Rapisarda**<sup>1</sup>, **Maria Castrogiovanni**<sup>1</sup>, **Antonio Cristaldi**<sup>1</sup>, **Eloise Pulvirenti**<sup>1</sup>, **Federica Bivona**<sup>1</sup>, **Lorenzo Lo Cicero**<sup>2</sup>, **Gea Oliveri Conti**<sup>1</sup> and **Maria Fiore**<sup>1</sup>

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Microplastics (MPs) represent a concern for the environment and human health. Our study investigated the MP exposure of dialysis patients (female: 8, male: 6, median age: 80 (61–84) and 74 (62–84), respectively) compared to controls (female: 7, male: 10, median age: 65 (55–67) and 66 (51–75), respectively). A patented method and SEM-EDX analysis were applied to identify MPs smaller than 10  $\mu\text{m}$ . We found higher median (interquartile range) MP levels in dialysis patients (females: 11,126 (3913–18,492) p/g vs. males: 10,438 (3672–16,699) p/g) than in controls (females: 5821 (2492–9944) p/g vs. males: 2906 (1664–5948) p/g). The median (interquartile range) MPs diameter was similar between dialysis cases (4.21 (3.63–4.56)  $\mu\text{m}$ ) and controls (3.82 (3.22–4.42)  $\mu\text{m}$ ). Further investigations with a larger sample size are necessary to investigate a possible relationship between MPs exposure and renal diseases.

#### 3.3. The DECARB Project as a One Health Approach in the Industrial Symbiosis

**Carmen Sica**<sup>1</sup>, **Gea Oliveri Conti**<sup>1</sup>, **Chiara Copat**<sup>1</sup>, **Pietro Nicotra**<sup>2</sup>, **Mimmo Scollo**<sup>3</sup>, **Luciano Falqui**<sup>3</sup>, **Giuseppe Bonfante**<sup>4</sup> and **Margherita Ferrante**<sup>1</sup>

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The negative effects of global warming on the well-being of the planet are already a reality. The WHO suggests taking preventive measures to mitigate the effects. The “One Health” approach is a multidisciplinary tool that, among other things, mitigates the effects of the carbon footprint through collective actions. Industrial symbiosis could enable this by reducing the environmental impact of greenhouse gas emissions through their recovery and reuse. DECARB is an ongoing project between the University of Catania, Plastica Alfa S.p.A., and Teamnetwork S.r.l., which are part of a consortium. It aims to recover CO<sub>2</sub> emissions from a cement plant to enable an algae growth system. A *Spirulina* microalgae crop will be used to produce active biomolecules to be used in pharmaceutical production and preventive medicine. We are validating the method to optimize the growth of algal biomass for phycocyanin extraction in closed photobioreactors (PBR), “AlgaeSpeed500L”, with a modified culture medium, BG-11.

The results obtained indicate optimal algae growth after 25 days of culture. We recorded a percentage increase in biomass of 491% compared to the beginning of the experiment, with an increase in biomass from 0.7 g/L to 4.14 g/L. Biomass was measured to validate phycocyanin extraction, and the protocol is currently under review for patent approval. The DECARB project will be an international model that can contribute to the implementation and optimization of the circular economy, both through carbon sequestration and by improving the extraction of food-grade phycocyanin on an industrial scale for use in pharmaceutical applications.

#### 3.4. Study of the Potential Neurodegenerative Effect of PM2.5 in Animal and Human Cells

**Antonio Cristaldi**<sup>1</sup>, **Rosalia Pellitteri**<sup>2</sup>, **Paola Dell’Albani**<sup>2</sup>, **Valentina La Cognata**<sup>2</sup>, **Eloise Pulvirenti**<sup>1,3</sup>, **Chiara Copat**<sup>1</sup>, **Maria Fiore**<sup>1</sup>, **Gea Oliveri Conti**<sup>1</sup> and **Margherita Ferrante**<sup>1</sup>

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Exposure to PM2.5 poses a significant risk to public health. We investigated its impact on the viability and cytotoxicity of OECs (olfactory ensheathing cells) and SH-SY5Y cells in vitro. PM2.5 samples were collected in Catania’s metropolitan area, with gravimetric determination and characterization of 10 trace elements and 16 polycyclic aromatic hydrocarbons (PAHs) conducted for each sample. The extracts were then exposed to the cell cultures, followed by assays to measure cell viability (MTT assay), mitochondrial and cytoskeleton damage, and assessment of the apoptotic process. Results revealed an average annual PM2.5 value of 16.9 µg/m<sup>3</sup> and a maximum of 27.6 µg/m<sup>3</sup> during winter, with higher concentrations of PAHs and trace elements in winter samples. The MTT assay demonstrated reduced viability in both OECs (44%, 62%, and 67%) and SH-SY5Y cells (16%, 17%, and 28%) after 24, 48, and 72 hours of exposure. Additionally, samples exposed for 72 hours exhibited greater mitotoxicity, vimentin functionality alteration, and effector caspases indicative of apoptotic process initiation. These findings underscore the detrimental effects of PM2.5 and related compounds on OECs and SH-SY5Y cells, emphasizing the urgency to curb fine particle emissions for environmental and public health protection.

### 3.5. Integration of Multiple Climate Change Mitigation Actions and Health Co-Benefits: An Exploratory Framework Using the Global Calculator

**Lorenzo Mangone<sup>1</sup>, Paolo Vineis<sup>1</sup>, Cathryn Tonne<sup>2</sup>, Rossella Alfano<sup>3</sup>, Alexandre Strapasson<sup>4</sup>, Christopher Millett<sup>5</sup>, Jem Woods<sup>1</sup> and Onesmus Mwabonje<sup>1</sup>**

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Tools of system dynamics permit the identification of the policy and technological interventions that could yield the greatest results in terms of climate change mitigation and help describe their potential health co-benefits. We used the Global Calculator (available online: <https://www.imperial.ac.uk/2050-calculator/the-global-calculator/> accessed on 30 September 2023) to simulate mitigation interventions of increasing severity in 43 different sectors, using the IEA 4DS scenario as a reference, and estimated the corresponding changes in yearly greenhouse gas emissions in 2050 and cumulative emissions in 2100. In addition, we considered the co-benefits for health associated with different levers/interventions using a semi-quantitative approach. Results showed that transitioning to renewables and making changes in agriculture, forestry, land use, and food production led to the greatest effects, while other sectors, such as carbon capture and storage or nuclear power, had a more modest impact. Large health co-benefits are expected from land use repurposing, transition to renewables, improved housing and buildings, changes in transportation, and food production and consumption habits.

### 3.6. The One Health Occupational Outlook

**Yevheniia Varyvoda<sup>1</sup>, Kelly Reynolds<sup>2</sup> and Frank A von Hippel<sup>2</sup>**

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To sustainably balance and optimize the health of people, animals, and ecosystems amidst conditions of uncertainty, ongoing threats, and emerging risks, it is crucial to have skilled professionals in the field of One Health. Although international organizations and governments acknowledge the significance of One Health, the workforce in this field remains uncharacterized and is not seen as an occupation but rather as an approach to solving complex health issues. One Health workers use scientific research, good practices, and interpersonal skills to address complex issues raised by the interface of human, animal, and ecosystem health, while also advancing knowledge in this field. In order to enhance employment prospects, a One Health occupational outlook project has been developed and is ready for presentation and discussion with various stakeholders from academia, government, industry, and the private sector. The outlook is based on the Bureau of Labor Statistics, US Department of Labor, Occupational Outlook Handbook (2021–2031). It provides details about the typical duties performed, work environment, required education and training, and important qualities needed. This will assist in navigating the One Health career profile, providing benefits for both workers and employers.

### 3.7. Surrogate's Healthcare Needs in Times of Social Crises

**Paola Salomone**

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The variety of legislations—or the total lack thereof—enormously impacts how gestational surrogacy can expose the individuals involved to vulnerabilities. Moreover, when countries regulate the practice, the ethical stance to be taken on it can change deeply depending on how and to what extent some aspects are being considered by the legislator.

The surrogate's health, both physical and psychological, is a topic that can generally be disregarded by permissive legislations. This became evident in the past years, with the unpredictable events of the COVID-19 pandemic and the outburst of the Russian war in Ukraine, two events that greatly shook healthcare systems. In this paper, I will focus on the gestational surrogate-specific healthcare needs, arguing that, outside of the dichotomy ban-regulation on surrogacy, having a greater focus on those needs may lead to having more suited national health systems even in times of crisis, alleviating already existing vulnerabilities.

### *3.8. Factors Determining Mercury Exposure and Health Effects in Young Children*

**Joan Grimalt, Mercè Garí and Marco Capodiferro**

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Mercury is a widespread toxic element. It is susceptible to long-range atmospheric transport, settling in all environmental compartments and accumulating in aquatic ecosystems. Mercury absorption can damage the kidneys, lungs, and cardiovascular and nervous systems, especially in early age periods, such as the embryos of pregnant women and children, as their metabolism and organs are still in formation. The inhabitants of Spain and Portugal have the highest body burden of mercury compared to the other countries of the European Union, and the differences are strong. The high consumption of fish and seafood is the main reason for this difference. Exposure to this metal is the main "One Health problem" affecting humans and the environment in Spain. Assessment of this problem requires the monitoring of mercury in fish consumed in markets and the investigation of the effects on neurodevelopment in children. These aspects are discussed in the present study.

### *3.9. The Mediterranean and Middle East University Network Agreement (MUNA) for the Environmental, Social, and Economic Study of Human Health Sustainability*

**Giulia Guerriero, Mercè Garí and Marco Capodiferro**

Mediterranean and Middle East University Network Agreement (MUNA), Federico II University, Naples, Italy

The current development model places unsustainable pressures of climate change on the natural resources—forests, land, water, and the atmosphere—causing an increasing frequency and intensity of natural and humanitarian disasters. The greatest challenge of the century is to meet the needs of current and future generations, of a large and growing world population, while at the same time ensuring the sustainability of the natural environment and human health. The Mediterranean and Middle East University Network Agreement (MUNA), with 35 different Universities within the Mediterranean region, is conducting an environmental, social, and economic study of sustainability to provide a real contribution to hinder environmental degradation, reduce poverty, increase food security, and use and reuse biodiversity species for human health sustainability. Here, we show how our MUNA experts are detecting and monitoring climate adaptation measures for an appropriate and effective technological innovation of sustainable management of diseases and social emancipation.

## **4. Poster Session**

### *4.1. Antibiotic Resistance and Pathogen Spreading: The Role of Wastewater Treatment Plants and Wastewater Reuse*

**Manuela Macrì<sup>1</sup>, Sara Bonetta<sup>2</sup>, Andrea Di Cesare<sup>2</sup>, Raffaella Sabatino<sup>2</sup>, Gianluca Corno<sup>3</sup>, Marta Catozzo<sup>1</sup>, Cristina Pignata<sup>1</sup>, Valentina Schiavo<sup>4</sup>, Claudio Medana<sup>4</sup>, Elisabetta Carraro<sup>1</sup> and Silvia Bonetta<sup>3</sup>**

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Antibiotic resistance (ABR) is a public health concern. According to the global action plan on antimicrobial resistance, wastewater's role in ABR selection and spreading must be monitored. Our aim was to evaluate antibiotic-resistant bacteria (ARB), antibiotic resistance genes (ARGs), and pathogen occurrence across wastewater treatments. Different steps of a wastewater treatment plant (WWTP) designed for agricultural wastewater reuse were evaluated: ARB/ARGs (cultural/molecular methods), antibiotics/heavy metals (HPLC-MS/ICP-MS), and pathogens (16S rRNA sequencing).

The results demonstrated the presence of ARB and ARGs with a decreasing trend across wastewater treatments. No difference in ABR rates was observed in different WWTP steps, but a correlation between some heavy metals/ARB rates was determined. Pathobiome characterization showed pathogen presence with decreasing abundance across the WWTP treatments. The results suggest the need to monitor WWTPs' role in ABR spreading, considering the One Health approach. Furthermore, our findings could suggest interventions to reduce human health risks associated with agricultural wastewater reuse.

#### 4.2. Structural Vaccinology against Emerging Pathogens

**Flavia Squeglia, Alessia Ruggiero, Maria Romano, and Rita Berisio**

Institute of Biostructures and Bioimaging, CNR, Turin, Italy

The World Health Organization has identified antimicrobial resistance (AMR) as one of the greatest threats to mankind. Inadequate treatment, development of drug resistance, and delays in diagnosis contribute to enhancing the mortality due to AMR diseases. Therefore, preventing rather than curing the infections is a promising solution.

The Marie Skłodowska-Curie Action BactiVax, Anti-Bacterial Innovative Vaccines, aims at training innovative PhD students and at the development of new vaccines against AMR infections.

In this framework, we are investigating a set of subunit antigens against emerging pathogens, including *Klebsiella pneumoniae*, *Enterococcus faecium*, *Staphylococcus aureus*, and *M. tuberculosis*. The specific research objectives at CNR-IBB are the characterization at a molecular level of novel, protective subunit vaccine antigens against target pathogens, and their improvement in terms of host response using a structural vaccinology approach. Structural and functional analyses of these antigens will afford new opportunities for vaccine development against antibiotic-resistant bacteria.

#### 4.3. Surveillance of SARS-CoV-2 in Wastewater of Piemonte Region (Italy): Trend and Relationship to COVID-19 Cases

**Lisa Richiardi<sup>1</sup>, Silvia Bonetta<sup>2</sup>, Cristina Pignata<sup>1</sup>, Lucia Decastelli<sup>3</sup>, Angelo Romano<sup>3</sup>, Manila Bianchi<sup>3</sup>, Angela Costa<sup>4</sup>, Bartolomeo Griglio<sup>4</sup>, Chiara Pasqualini<sup>5</sup>, Carlo Di Pietrantonj<sup>5</sup>, Giuseppina La Rosa<sup>6</sup>, Elisabetta Suffredini<sup>7</sup> and Elisabetta Carraro<sup>8</sup>**

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Wastewater-based epidemiology (WBE) is a complementary approach to laboratory-based surveillance for monitoring SARS-CoV-2 circulation and variants.

In the Piemonte Region (northwest Italy), 588 raw wastewater samples from 6 wastewater treatment plants (WWTPs) were collected and analyzed from October 2021 to April 2023. Viral RNA was detected in 97.4% of the total samples. Weekly SARS-CoV-2 concentrations in wastewater were compared with weekly new cases of COVID-19-positive subjects in the WWTP catchment areas, showing good agreement between the two data series. This was particularly evident during the most intense epidemic wave of December 2021–February 2022, but also during the periods of low incidence.

WBE has the potential to effectively integrate laboratory-based surveillance due to its ability to describe spatial and temporal trends of SARS-CoV-2 at the population level in near-real-time. Using this approach, it will be possible to monitor the circulation of other viral pathogens in the population.

#### *4.4. Gut Microbiome Modulators as Alternatives to Antimicrobials for Management of Post-Weaning Diarrhea in Pigs*

**Verity Ann Sattler<sup>1</sup>, Anouschka Middelkoop<sup>2</sup>, Mattia Pirolo<sup>3</sup>, Soumya Kar<sup>4</sup>, Veronika Nagl<sup>1</sup>, Francesc Molist<sup>4</sup> and Luca Guardabassi<sup>1</sup>**

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Consumer demand and governmental pressure are rising to reduce the use of antimicrobials in the veterinary sector due to the risk of zoonotic transmission of antimicrobial resistance to humans and its negative impact on animal health. The multi-actor project AVANT1, part of the EU Horizon 2020 program, aims at developing alternatives to antimicrobials, such as gut microbiome modulators (probiotics) to reduce the risks of intestinal diseases, especially around weaning. A scientific feeding trial performed within this project showed results of the effects of two probiotic prototypes compared to colistin in pigs under challenged conditions. The impacts on animal performance, diarrhea incidences, gut microbiota modulation, production of beneficial metabolites (short-chain fatty acids), intestinal host gene expression levels, and immunological responses in intestinal and serum samples were investigated. Results showed that gut microbiome modulators could improve animal performance, and had an impact on microbiota diversity and composition, as well as pig gene expression levels.

#### *4.5. Artichoke By-Product Flour as a Promising Food Ingredient with Functional and Anti-Diabetic Effects*

**Rosa Palmeri, Lucia Parafati, Fabiola Pesce, Ilaria Proetto and Cristina Restuccia**

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Artichoke (*Cynara cardunculus* var. *scolymus*) is used in various food preparations, but except for the “head”, the other parts of the plant are disposed as waste. In the present study, two flours, respectively obtained from bracts (FB) and stems (FS), were evaluated for their bioactive compounds, antimicrobial features, and for their ability to inhibit  $\alpha$ -glucosidase, a crucial enzyme that catalyzes the final stage of carbohydrate digestion.

Radical scavenging activity, by the DPPH assay, registered the values of  $87\% \pm 0.04\%$  and  $60\% \pm 0.02\%$  for extracts of FB and FS, respectively. Promising results were even obtained in inhibition of  $\alpha$ -glucosidase, up to 70%, in comparison to the control. The results obtained suggest the potential use of artichoke by-product flours in order to formulate different foods with improved functional characteristics and with the ability to inhibit the absorption of carbohydrates from the small intestine and the rise in postprandial blood glucose concentrations, therefore, exerting an anti-diabetic effect.

## 5. Statement of Peer Review for Accepted Abstracts

The authors certify to the publisher that all accepted abstracts in Sections 3 and 4 have been subjected to peer review administered by the authors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal.

- Type of peer review: single-blind peer-review.
- Conference submission management system: EasyChair.
- Number of submissions sent for review: 56.
- Number of submissions accepted: 51.
- Number of submissions published: 14.
- Acceptance rate (number of submissions accepted/number of submissions received): 91%.
- Average number of reviews per paper: 3.
- Total number of reviewers involved: 22.
- Any additional information on the review process and regulations: Abstracts were reviewed via single-blind peer reviews. The review of each abstract was carried out by at least three independent reviewers, considering the following criteria:
  - coherence with the main topic
  - coherence with the selected domain
  - scientific relevance for the conference topics
  - consistency
  - scientific references of the article.

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