



# THE CRUISER MICROBIOME

# QUANTIFYING LIFE WITH DIGITAL BIOLOGY

- Biotechnology company with the mission to embed DNA technologies in business operations.
- We provide **end-to-end**, **personalised** solutions to our customers using cutting-edge technologies.
- We use **innovative technologies** to sequence genetic material and we analyse complex data using Bioinformatics and Artificial Intelligence methods.
- We employ and collaborate with scientists world-renowned in their field. Thus, we have the possibility to provide **consulting services**, add to the theoretical background of the problem and co-shape with our clients their personalised solution.

# Areas of Expertise

## Metagenomics of Built Environments



- **Detection and monitoring** of all microorganisms found in a built environment.
- The sampling method is **non-invasive** and can be applied to air, liquids and surfaces.
- Huge range of applications such as hospitals, public buildings, means of transport, livestock units, water supply systems, sewage, archaeological excavation sites and works of art.

## Agrigenomics



- **Genetic identification** of ingredients in organic samples such as food and soil samples, using state-of-the-art technologies (Next Generation Sequencing, microarrays).
- Applications in agriculture, animal husbandry and across the wide range of food industry.

# The scientific team - MBE



## CSO (Chief Scientific Officer)

**Prof. Christos Ouzounis** is the CSO and cofounder of the company, and a Prof. in Bioinformatics at AUTH. He holds a B.Sc. in Biological Sciences (AUTH), an M.Sc. in Biological Computation and a DPhil in Computational Chemistry and Structural Biology, both from the University of York. He has lead core bioinformatic facilities at EMBL-EBI, King's College London and CERTH in Thessaloniki.



## CTO (Chief Technology Officer)

**Christos Karapiperis** is the CTO and co-founder of the company. He has a Bachelor's degree in Computer Science, an MBA degree from the University of Sheffield and is a PhD Candidate in Bioinformatics at AUTH. He has over 20 years of experience in IT and Bioinformatics projects.



## Bioinformatics Expert

**Dr. Anastasia Chasapi** holds a Bachelor's degree in Biological Sciences (AUTH), an M.Sc. in Proteomics and Bioinformatics from the University of Geneva and a PhD in Computational Biology from the University of Lausanne. She has worked for years at the Swiss Institute of Bioinformatics as a collaborating scientist. Currently she holds a Research position at CERTH.



# The scientific team - Agrigenomics



## Agrigenomics Team Leader

**Dr. Zoe Chilioti** is an agronomist, she holds an M.Sc. in Greenhouses / Protected Crops and a PhD in Molecular Plant Biology. She has many years of experience as a collaborating scientist at Johns Hopkins University and the NIH in USA. Currently she is leading a research group at CERTH in Thessaloniki.



## Agrigenomics Expert

**Dimitrios Valasiadis** is an agronomist, he holds an M.Sc. in Genetics & Plant Breeding and is a PhD candidate in Systems Biology & Post-Harvest Physiology. Currently, he is an active researcher in the field of Applied Life Sciences.



## Biologist

**Athanasia Alexandridou** recently obtained a Bachelor's degree in Biological Sciences from the University of Oklahoma, USA. She is currently conducting her first research steps in Applied Life Sciences.

# Metagenomics in Biosafety

- Detection and monitoring of infectious agents in key areas of human activity (eg hospitals, schools, water supply system) is essential for effective prevention and control of health risks.
- MBE technology allows the **exhaustive identification** of all microbes in a sample and constitutes a **universal solution** for the identification of pathogenic microbial communities in an environment, without the need for special tests for expected or well-characterised pathogens.
- Our advanced bioinformatics platform permits the identification of biological risk factors and helps us set priorities and provide guidelines for the **prevention** of public health issues.



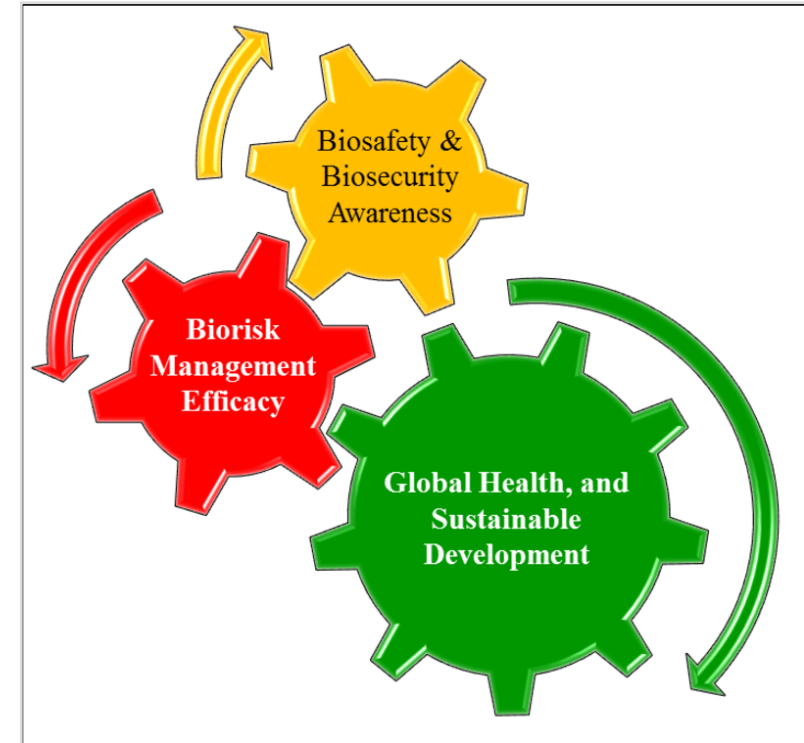
# The problem

- Cruise ships are **intense mobility** hubs among people from all over the world, who can carry infectious agents.
- The problem is exacerbated as **microbial diversity varies** around the world. As a result, there is risk of exposing customers and staff to unknown pathogens with increased infectivity.
- The recent SARS-Cov2 pandemic has created a **climate of insecurity** towards the use of leisure services, especially when it involves using indoor public spaces.
- At the same time, citizens are now more aware and better informed about biosafety issues, and therefore more **demanding** from services provided to them.



# Proposed solution

- Our main goal is to **detect and monitor** microbial communities located in public and non-public areas and to record hotspot areas and transmission patterns.
- By constructing almost complete genomes from metagenomic samples, we are able to **exhaustively identify** all potential biological hazards as well as monitor their spread in cruise ships.
- Monitoring pathogens in the environment in almost real time allows targeted and **effective infection control measures**.
- The detection and monitoring of pathogens in indoor **air**, indoor and outdoor **surfaces** as well as in the **water supply** and produced **wastewater** provides a comprehensive record of the ship's epidemiological state.





# Air - Water - Surface Monitoring



Cruiser rooms



Indoor common areas

*lounge, restaurants  
elevators, bathrooms  
casino, gym*



Outdoor common areas

*swimming pool water  
Swimming pool area  
decks*



Production facilities

*food preparation area  
washing rooms*



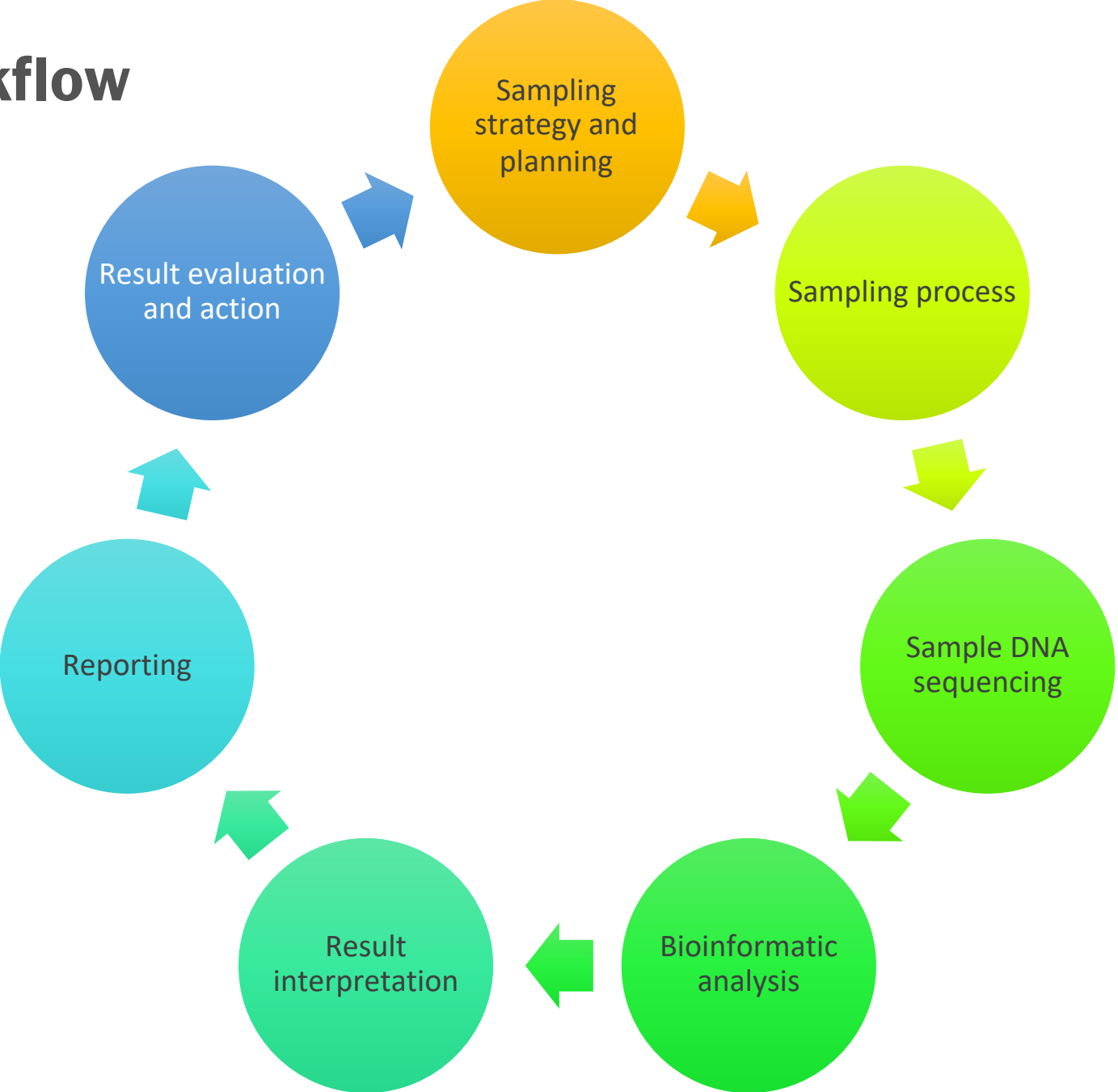
Water supply and  
wastewater

# Benefits for the Luxury Cruise Ship

- Identifying and monitoring the cruiser's microbial footprint will create a **safe and trustworthy environment** both for the staff and customers.
- The cruiser administration will have **imminent information** of possible health threats and will be able to take the necessary measures.
- The **interactive result reports** generated by the DNA sequence platform can be used for controls and to inform interested third parties.



# Our circular workflow



# Comparison of Existing Approaches

Criteria	Classic Microbiology	Molecular Analysis (PCR)	Metagenomic Analysis
Sample preparation difficulty	**	*	
Possibility for automated sample collection			***
Technical skill required for analysis	*	**	*
Time required for analysis	***	**	*
Result precision and accuracy		*	***
Amount of microbes that can be identified	*	*	***
Equipment & Hardware Cost	*	**	***



# Dedicated Biosafety Platform

- Our Biosafety platform includes three main axes of analysis:

- 1. Sample sequencing*
- 2. Bioinformatic analysis and result interpretation*
- 3. Statistical analysis and presentation of the results*

- For the Biosafety platform hosting, we encourage the development of **local infrastructures** in the cruiser, which will give full control and immediate access of all produced data to the cruiser direction.
- The dedicated Biosafety Platform will consist of:
  - 1. A Data Center**, equipped with sufficient computing power and storage space, holding all produced data
  - 2. Network and Data Security** structures, such as back up devices
  - 3. A Crisis Management Room**, with teleconferencing capabilities.
- The above can be achieved through the collaboration with a contractor with expertise in the field.



# THANK YOU FOR YOUR ATTENTION

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