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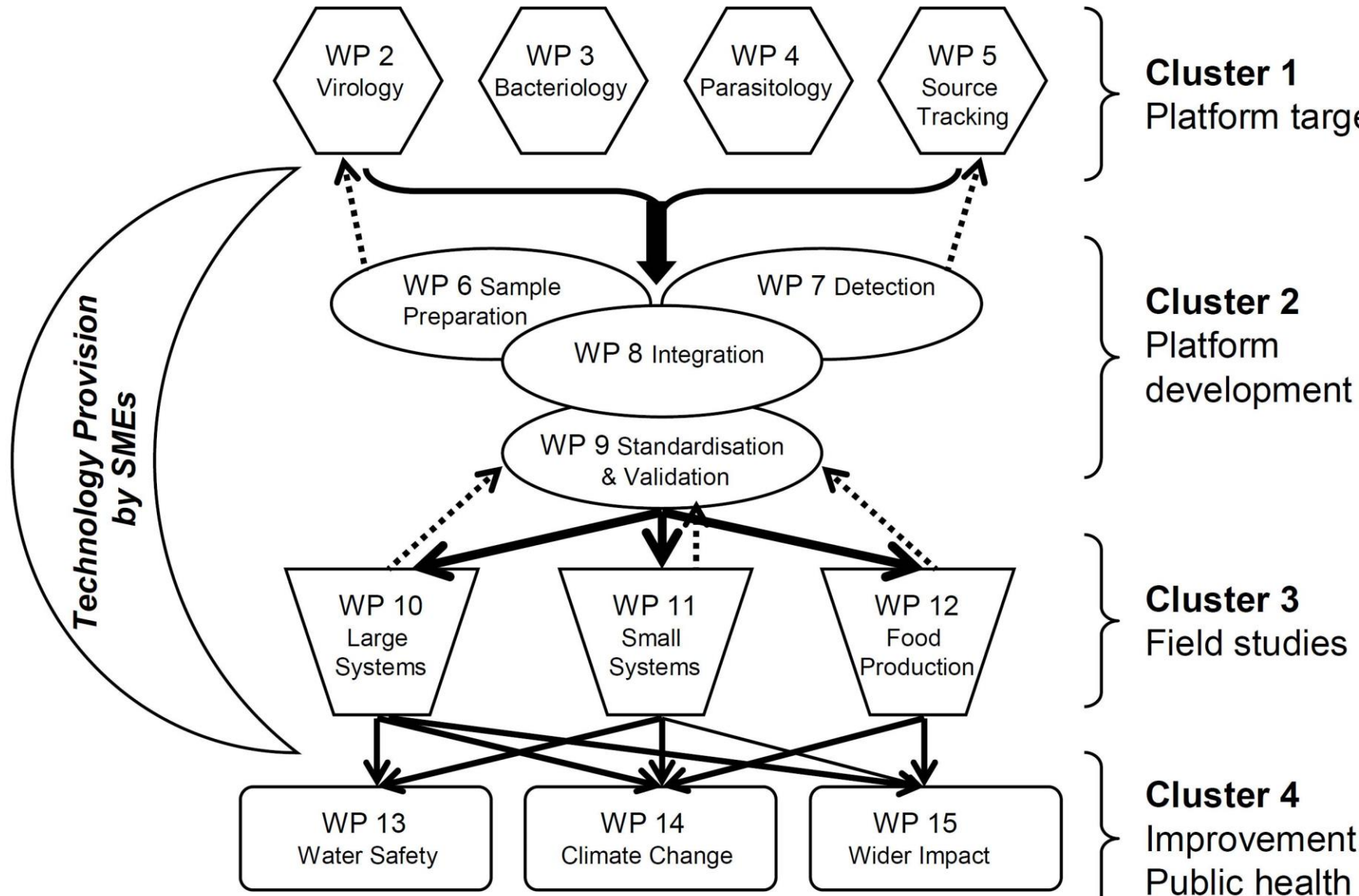
Protecting the health of Europeans by
improving methods for the
detection of pathogens in drinking water
and water used in food preparation

AQUAVALENS

- 39 partners
- 14 different countries
- €9 million
- 5 years (February 2013 to January 2018)



AQUA VALENS – Research strategy



The time critical steps

Milestone		Month	Date
MS10	Workshop to determine which of cluster 1 developments will be taken forward into cluster 2	22	Nov 2014
	Mid Point review	33	Oct 2015
MS32	Workshop to determine which technological platforms will be used for field studies	36	Jan 2016
MS36	Market development workshop with partner SMEs	48	Jan 2017

Cluster 1

- Generate new knowledge on the molecular genetics of viral, bacterial and parasitic waterborne pathogens.
- Identify gene targets for the identification, and characterisation of these pathogens, that will also enable the determination of their virulence for humans.

Tasks for WP2 - Viruses

1. Establish robust quantitative molecular multiplex systems for detection of health-significant enteric viruses
2. Investigate pre-treatments of target viruses in order to provide a better estimation of infectivity through genome copy determination
3. Investigate specific virus damage through some specific virucidal treatments
4. Generate typing tools for health significant human and animal viral pathogens in clinical and environmental samples

Tasks for WP3 - Bacteria

1. Development and application of advanced pyroprinting to determine the load and identity of all selected bacterial pathogens at the species level
2. Development and application of molecular markers for the identification of single strains of all major species of waterborne bacterial pathogens
3. Development and application of molecular methods for assessment of in-situ viability of bacterial populations using viability PCR (vPCR)
4. Development and application of molecular and experimental methods to assess virulence and infectivity of pathogenic bacteria in freshwater

Tasks for WP4 - Protozoa

1. Identification of protozoal reference genome sequences and generation of new *Cryptosporidium* sequences
2. Differential expression and validation of *cryptosporidium* putative virulence markers
3. Identification and validation of *C. parvum* and *C. hominis* subtyping markers
4. Identification and validation of *giardia* virulence factors
5. High resolution identification and validation of infectivity markers for *Toxoplasma gondii*
6. Integration of selected protozoal markers in platform development

Tasks for WP5 – Microbial Source Tracking

1. Literature critical review and selection of indicators
2. Implementation of methods and setting operating principles
3. Measuring faecal load in polluted waters - sampling campaigns
4. Selection of indicators and development of MST predictive models by inductive learning methods
5. Testing and validating the developed MST models at European level
6. Integration of selected indicators in platform development

Cluster 2

- Use the knowledge gained to develop new technologies that integrate sample preparation and detection into a single platform.
- These platforms will then be subject to a rigorous process of validation and standardisation.

Tasks for WP6 – Sample preparation

1. Concentration of pathogens from surface raw waters using low cost hollow fibre ultrafiltration
2. Efficient and low cost concentration for molecular pathogen detection in large volumes of water using NanoCeram filter
3. Use of positively charged glass wool as a cheap concentration system for the recovery of microorganisms from water
4. Microfluidic techniques for the separation of pathogens in filter concentrates
5. Tool box for (RT)-PCR and microbiological detection and quantification of virus, bacteria and protozoa
6. Suitability of the methods developed on typical local water to process a broader variety of water types

Tasks for WP7 - Detection

1. Standardized pathogen detection
2. AquaTAS: Development of a micro-Total Analytical System for on-site identification of contamination of water sources for human consumption
3. ATP Biosensor
4. Early warning system for bacterial indicators
5. FISH technology for detection of bacterial pathogens
6. Immunofluorescence technology for detection of Cryptosporidium
7. Develop VOCMA (Variation tolerant Capture Multiplex Analysis) for detection of all targets identified in cluster 1 on the Luminex platform

Tasks for WP8 - Integration

1. Development of an automated optical imaging system for the quantification of fluorescent bacterial cells
2. Development of automated and integrated tools for the extraction of parasites, viruses or bacteria from sample preparation
 1. Development of a stand-alone automated elution equipment for high and low-tech laboratories.
 2. Integration of new filters into an existing on-line automated sampling module for pathogen detection
3. Support of the ATP platform integration
4. Integration of sampling and detection techniques on a prototype for multiplex pathogen detection

Tasks for WP9 – Standardization and validation

1. Workshop and selection of target organisms
2. Standardised Controls and Standard Operation Protocols
3. Validation with nucleic acids
4. Validation with micro-organisms in different matrices
5. Second Workshop and final round of validation
6. Evaluation of the results

Cluster 3

- We will use the validated platforms to undertake a series of field studies in large and small drinking water systems, and in food production.
- These field studies will generate new knowledge about the risk to public health from waterborne pathogens in Europe and also test the value of the technologies in the field.

WP10 - Large water systems

1. Characterisation of large water distribution systems and selection
2. Definition and installation of analytical tools to be tested and kind of use in the different systems
3. Application of the chosen technologies in the analysis of water samples from large drinking water treatment plants
4. Application of the chosen technologies in the analysis of water samples from large distribution networks
5. Evaluation of the measuring campaigns in the large drinking water systems

WP11 – Small water systems

1. Assessment, implementation and training of the technology
2. Sample collection and analyses
3. Assessment of results meeting – problem solving – implementation of a pilot treatment
4. Sample collection and analysis – Round 2
5. Dissemination of technology

WP12 – Food production

1. Implementation of developed technologies in assessing irrigation water quality
2. Implementation of developed technologies in the ready to eat industry
3. Implementation of developed technologies in the bottled water industry
4. Workshop to discuss work package outputs

Cluster 4

- We test how these technologies can be used to protect human health, though improving the effectiveness of Water Safety Plans, adaptation to climate change, and control of outbreaks of infectious disease.
- We will also determine the sustainability and potential economic impacts of these technologies.

WP13 - Water safety plans

1. Develop and administer a questionnaire to the water utilities at the start of the sampling activities undertaken as part of WP 10 and WP 11
2. Develop indicators to measure performance of WSP with and without the new technical platforms
3. Establish the effectiveness of the developed platforms as a part of a preventive management tool
4. Development and applications

WP14 – Emerging threats

1. Linking microbiology to climate data
2. Linking microbiology to health data
3. Quantitative Microbial Risk Assessment
4. Emerging infections

WP15 – wider impact

1. Evaluation of the environmental impact and the carbon footprint
2. Cost-benefit analysis and determination of economic gains
3. Applying specific technologies and/or platforms in developing countries
4. Strengthen Europe's global leadership on the health water related risk