

The logo for IMAQUA features the word "IMAQUA" in a stylized, sans-serif font. The letters "I", "M", and "A" are a light teal color, while "Q", "U", and "A" are a darker blue. A light teal wave-like graphic element is positioned between the "Q" and "U".

IMAQUA

AQUACULTURE IMMUNOLOGY TECHNOLOGIES







# COMPANY

IMAQUA is a private contract research organization established in 2015 based on more than 20 years of academic research on shrimp health at Ghent University, Belgium.

We are exclusively dedicated to supporting companies developing shrimp health and nutrition products, disease resistant shrimp genetic lines and shrimp farming concepts. To this end, we use proprietary testing models and state-of-the-art facilities that allow for a high degree of precision and a multitude of testing possibilities while producing data under the highest quality standards.

We are an independent organization which is driven by quality, reliability and confidentiality. We prioritize client specific R&D needs while providing impartial and objective advice to each client. We believe that by contributing to each of our client's projects, we ultimately contribute to the sustainable development of the global shrimp aquaculture industry.

IMAQUA works for promoting sustainable growth of shrimp aquaculture.



# TEAM

Our team of experienced professionals assures that all the trials are performed under the highest standards of quality and precision.

Our scientists specialized in fields such as shrimp pathology and immunity, nutrition, development of testing models and microbiology operate as project managers. They closely follow up and coordinate each client project and give continuous support and advice on all stages of product development. They carry out internal R&D which is the basis for the continuous improvement of existing and development of new services.

Technical experts ensure that trials are conducted following well-defined proprietary standard operating procedures. They ensure that all collected data complies with the highest standards of quality, following GLP and GCP guidelines. Their careful observation, precision and continuous process monitoring assures that no detail is lost or unattended.

Process management team ensures that all teams cooperate in managing quality assurance and biosecurity systems which prevents unexpected problems during trials and improve the overall quality of results.



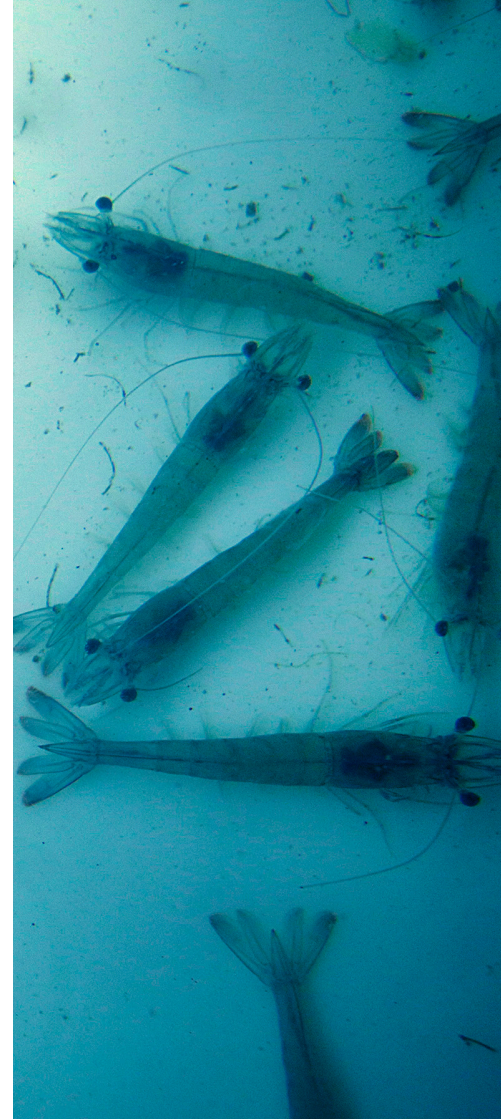


# SERVICES

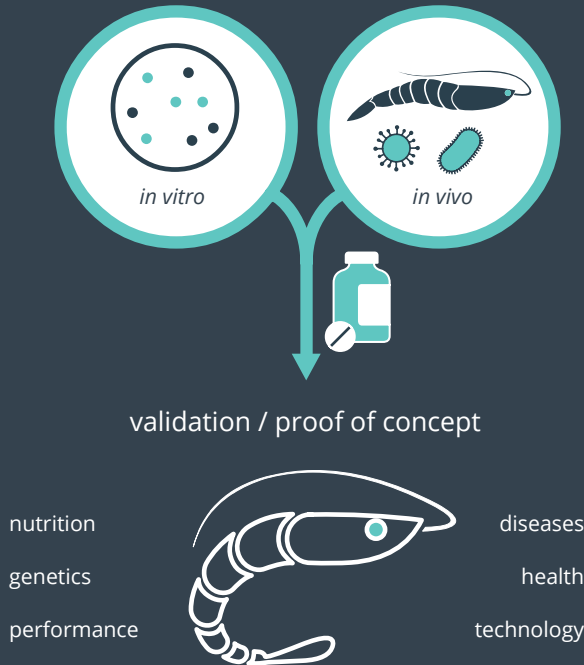
At IMAQUA we believe that the best approach to providing quality services is through a close interaction with our clients and a continuous support through all the stages of product development. We follow and advise every client individually depending on their specific R&D goals and particularities of their experimental products. Always keeping in mind strict standard operating procedures, we introduce the maximum resilience for optimal accommodation of our client needs.

The combination of solid scientific and technical knowledge plus the versatility of our high-tech facilities, enable us to offer optimal experimental designs tailored to the needs of each client.

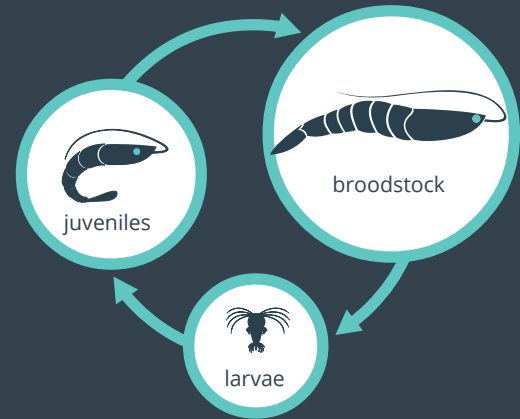
Often product development starts with *in vitro* screening trials, where candidate products are selected and upscaled gradually until the final stages of proof of concept and valorization *in vivo*. This strategy allows us to offer the most powerful and cost-effective R&D solutions.



We currently offer the widest range of research services in the industry, from the initial stages of product screening *in vitro* to the last stages of proof of concept *in vivo*.

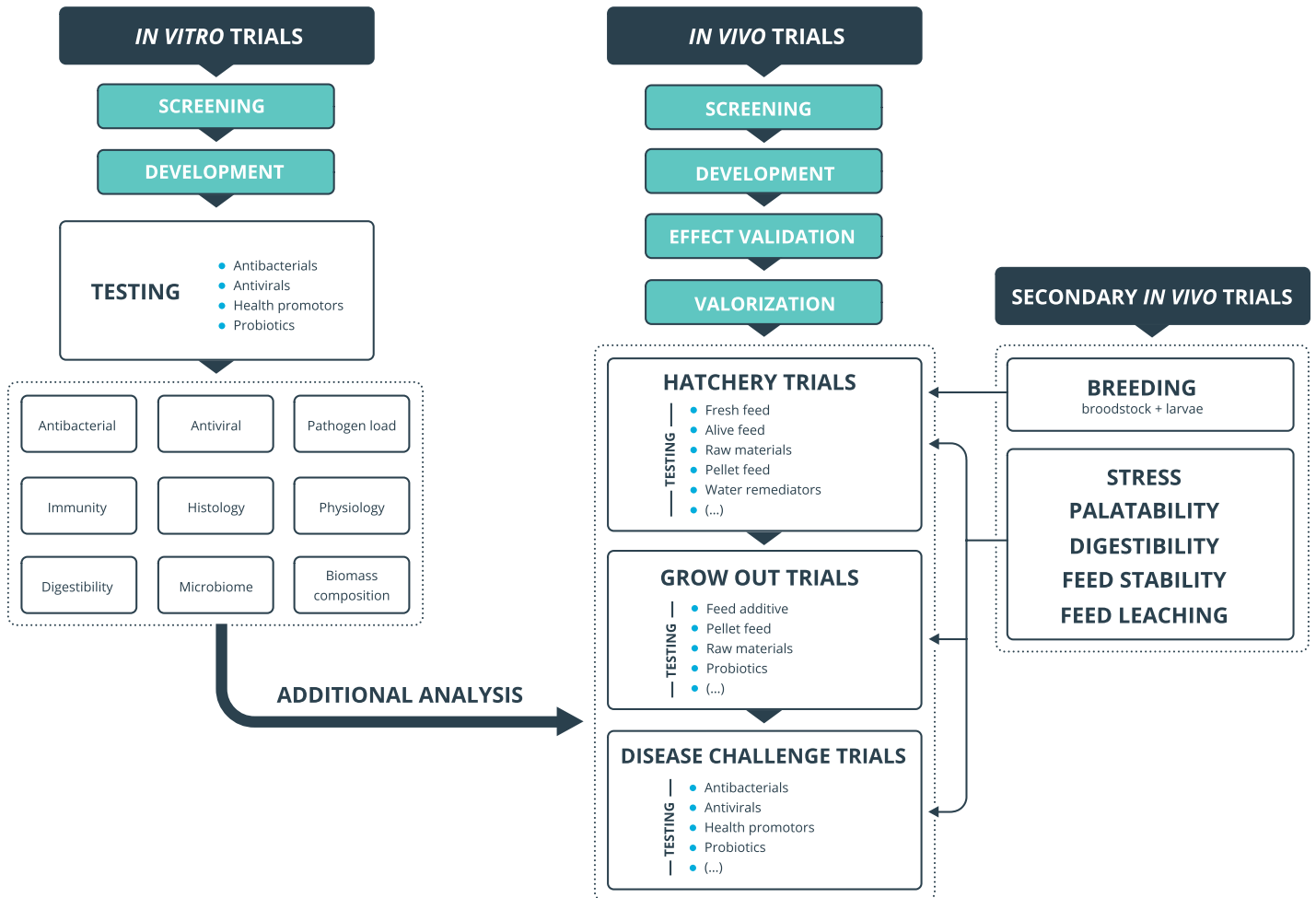


Our *in vivo* trials can be performed in all life stages of shrimp, from larvae through juveniles to broodstock.



target species: *Penaeus vannamei*





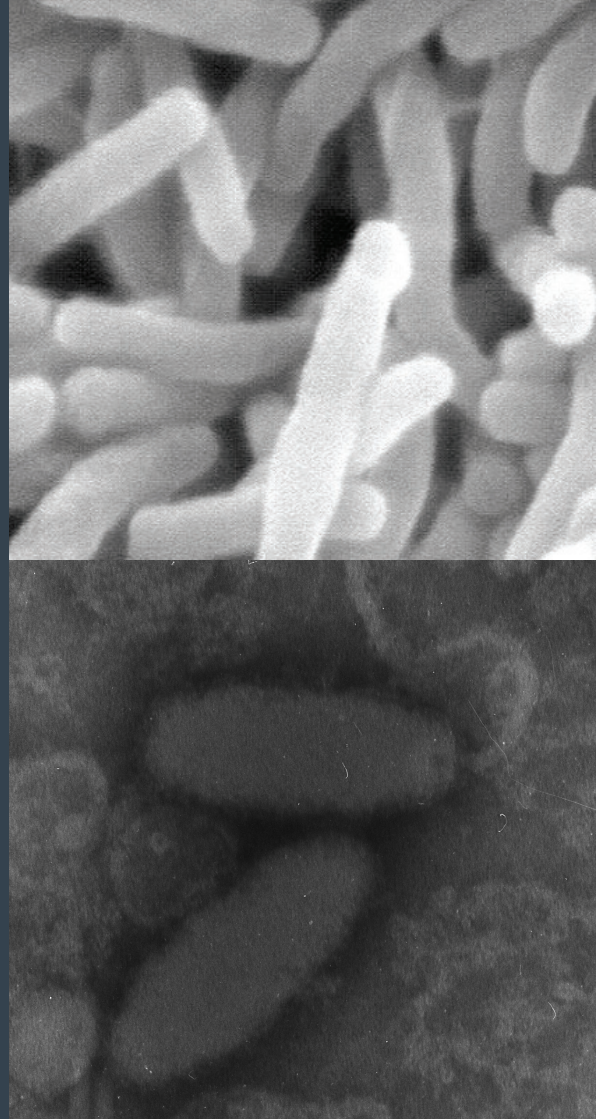
# MODEL PATHOGENS

We have an in-house collection of shrimp bacterial and viral pathogens that can be used in a variety of *in vitro* and *in vivo* tests.

Our team has a longstanding experience with *in vivo* challenge trials with White Spot Syndrome Virus (WSSV) and Acute Hepatopancreatic Necrosis Disease/Early Mortality Syndrome (AHPND/EMS).

Our pathogen inocula are carefully characterized (purified, titrated and tested for contaminants) to ensure the standardization and reproducibility of our disease challenge models and *in vitro* pathogen tests.

For some of the most important pathogens we have strains with different virulence and geographical origin, what makes them useful in different applications, depending on the objective of the trial.



# RESEARCH DIETS

We produce 90% of the experimental diets which are tested at our facilities.

We have a nutrition laboratory where we produce experimental diets starting from raw materials. We can produce diets using warm and cold pellet pressing, extrusion, vacuum coating and top coating.

In addition to diet production, we perform trials on:

- Feed stability
- Diet leaching
- Diet nutrient profiling





## IN VITRO TRIALS

We offer a variety of *in vitro* analyses either for screening candidate products (e.g. bacteriostatics, virucidals) or as complementary analysis to *in vivo* trials.

We have a dedicated BSL2 laboratory for performing microbiology, molecular biology, histology and immunology tests. It is equipped with modern laboratory machines and allows us to perform a variety of high precision laboratory tests.

Using *in vitro* tools for screening candidate products brings the advantage of reducing the testing time and maximizing the trial cost/benefit.

Using *in vitro* tools as trial complementary analysis allows collecting additional information on the mode of action of test products. This maximizes their commercial value.



Standard *in vitro* tests for screening antimicrobials:

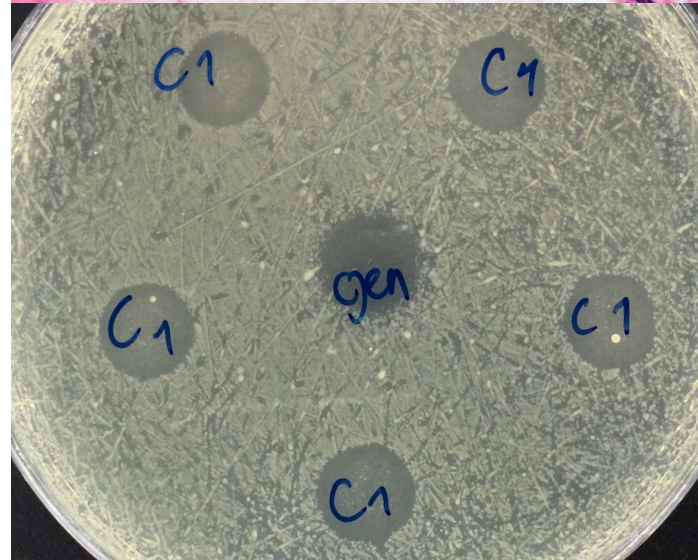
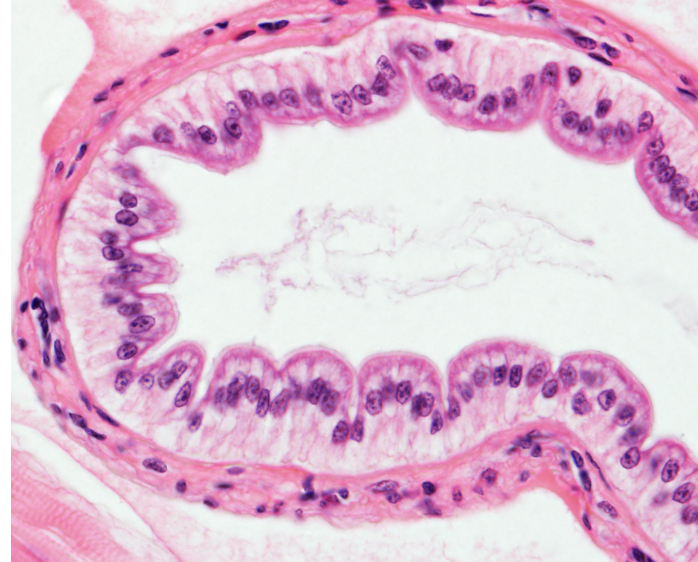
- Minimum inhibitory concentration (MIC)
- Minimum bactericidal concentration (MBC)
- Kinetics of bacterial pathogen inhibition
- Agar diffusion assay (ADA)
- Pathogen & probiotic co-culture
- Anti-WSSV activity
- Pathogen agglutination assay

Standard trial *in vitro* complementary analyses:

- Classic immune parameters in haemolymph
- Expression of immune-related genes by qPCR
- Pathogen detection and load in tissues by qPCR
- Histology of hepatopancreas and midgut
- Microbiology of digestive system

Other *in vitro* analyses:

- Feed and carcass composition analysis
- Digestibility analysis
- Haemolymph physiological parameters







# IN VIVO TRIALS

Using our specialised and unique testing infrastructure and standardised testing models we offer optimal experimental designs.

These tools are used for developing and validating *in vivo* the effect of products and support the commercial valorization of products.

We ensure the reproducibility and high quality of results by performing these *in vivo* tests under standard and fully controlled conditions and following well-defined standard operating procedures. This brings in certainty and value for money to our work by assuring our clients they will find a specific test performed under standard conditions whenever they need it.



# HATCHERY TRIALS

Our breeding infrastructure includes all the sections necessary to breed *P. vannamei* indoors. This includes broodstock maturation and spawning, larval rearing and alive feed production.

Besides its active use for producing animals needed for all our trials, the infrastructure was specifically designed to be used as breeding trial infrastructure.

Type of trials performed in the hatchery systems:

- Alternatives for fresh and alive feed
- Control of broodstock maturation
- Enhancers of breeding performance
- Optimization of larval rearing



The broodstock maturation section includes 2 independent RAS systems each equipped with 3 tanks of 1.5m<sup>2</sup>. These 2 systems can be used for testing 2 different products that can spread in the water column and contaminate the other treatment. These 6 tanks can also operate as a single RAS system for testing 6 different treatments.

The larval rearing section includes 12 tanks of 100L and 6 tanks of 250L. These 2 tank sets run each in an independent RAS, however every tank can be run individually. This offers more testing possibilities.

The alive feed infrastructure includes microalgae production and artemia hatching.





## GROW OUT TRIALS

Our lab scale grow-out infrastructure includes 45 feeding tanks of 300L distributed over 3 individual testing rooms. These tanks are custom-built following a well-tested IMAQUA original design. Each group of the 15 tanks is run on a complete recirculating aquaculture system (RAS). Alternatively, these tanks can be run each on individual RAS (IRAS), which means that each tank can be run individually without sharing water with other tanks. This system is specifically designed to perform trials with products (e.g. probiotics) that spread in the water column and as such can spread from treatment to treatment if all the tanks are connect to the same RAS system.

We design diet formulas specific to the objectives and needs of our clients. Depending on the type of experimental product (raw material, feed additive, probiotic, etc) we can design the formula and the production technology that best suits each product properties. Tailoring experimental diets and producing in laboratory scale allow us to optimize testing efficacy and flexibility.



Each feeding tanks is also equipped with:

- Faeces collectors for performing feed digestibility measurements
- Water and air flow measurement
- Individual temperature measurement and control systems
- Automatic feeders

Specific features of the growth performance trials are:

- Option to run tanks under different environmental conditions (temperature, salinity, pH, etc) within the same trial
- Adjustable duration and shrimp stocking densities
- Standard feed produced at IMAQUA
- Tailored feed formulated and produced at IMAQUA
- Standard artificial seawater and biofilter

Type of trials performed in the nutrition systems:

- Growth performance trials
- Digestibility trials
- Stress (salinity, oxygen, temperature)
- Palatability/attractability





## DISEASE CHALLENGE TRIALS

Our disease challenge trial infrastructure includes 920 challenge tanks of 10L distributed over 3 individual testing rooms. These tank setups are custom-built following a well-tested IMAQUA original design, that is unique in the world.

Each tank is equipped with a biofilter and aeration system, which means that each tank is run individually without sharing water with other tanks. Water temperature is maintained using an industrial room temperature control system. This infrastructure was specifically designed by IMAQUA to decrease variation between treatment replicates during disease challenge trials. This allows us to precisely reproduce disease challenge models over time and therefore, increase cost efficiency.

Each disease challenge tank is equipped with:

- Biofilter
- Aeration
- Automatic temperature measurement

Specific features to disease challenge trials are:

- Standard and reproducible disease inoculation models (oral, immersion, intramuscular, intra-antennal gland)
- Individual housing of shrimp
- Individual inoculation and monitoring of shrimp
- Standard artificial seawater and biofilter
- Reproducible mortality curves

Type of trials performed in the disease challenge systems:

- Efficacy of antimicrobials
- Antimicrobial properties of probiotics
- Validation of genetic selection for disease resistance



# MONITORING, AUTOMATION AND DATA MANAGEMENT

We have central electronic systems for monitoring our facilities, automating our operations and collecting and managing data. They ensure protection and optimal collection of experimental data.

Monitoring of vital components of our installations is done 24/7 using a network of sensors that are managed by a central computer using a professional monitoring software. When sensors are activated (e.g. water level, air flow, etc) the computer sends alarms to our technical team, which immediately intervenes at any time to solve the problems. With this system we ensure that no problems go unnoticed and therefore protecting trials against failure. This system also continuously collects experimental data such as tank temperature.

This computer system gives us flexibility to automate essential experimental procedures such as feeding, photoperiod duration, temperature control, etc.

We have a central system for collection, management and backup of data. These systems allow us to collect data in real-time both automatically and manually. The data management is done under a collaborative system for optimal reliability, flexibility and efficient use of resources. All data is continuously backed up within our facilities, which means that we do not create copies of data in third party locations. All data is managed behind several layers of security.

Our central monitoring system includes:

- Energy blackouts
- Tank aeration
- Tank water flow
- Tank water leakage
- Tank temperature
- Room temperature
- Tank water levels
- Door opening

Our central system for automation includes:

- Room photoperiod
- Room temperature
- Tank temperature
- Feed distribution
- Many other possibilities





# CONTACT US

You can contact us for more information at [info@imaqua.eu](mailto:info@imaqua.eu) or if you would want to discuss the testing possibilities for your specific product. We are at your disposal for finding the best solutions for reaching your goals.



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