

# BicarPlus™ in Crustacean Aquaculture

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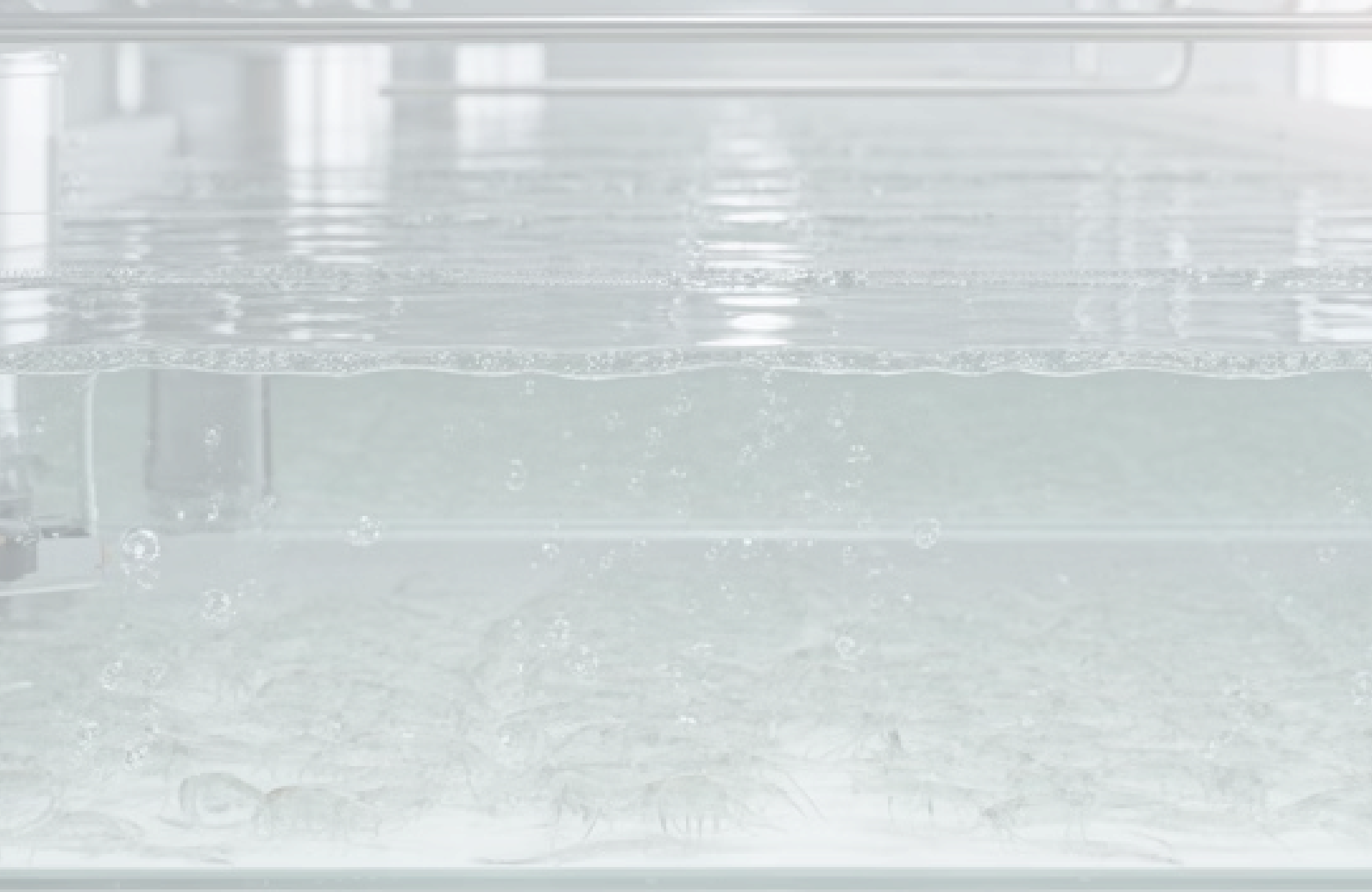


# BicarPlus™: Alkaline Buffer for Crustacean Aquaculture

BicarPlus™ is an ultra-pure, modified and stabilised sodium bicarbonate developed by Intabiotech, conceived as a premium technical solution for pH regulation, alkalinity stabilisation and maintenance of salinity balance in aquaculture systems. This technical guide details its mechanism of action, validated applications, limitations and the recommended technical wording for professional use in shrimp and crustaceans.

TECHNICAL GUIDE

CRUSTACEAN AQUACULTURE



# 1. Alkalinity Buffer, Not an Aggressive pH Raiser

BicarPlus™ provides bicarbonate ions ( $\text{HCO}_3^-$ ) and sodium ( $\text{Na}^+$ ) to the aquatic medium. Its function is not to raise pH abruptly or aggressively, but to increase **alkalinity**, that is, the water's ability to resist sudden pH fluctuations in either direction. This distinction is fundamental to its correct technical prescription.

In intensive systems, closed ponds, transport tanks and waters with low buffering capacity, pH instability is one of the main physiological stress factors for shrimp. BicarPlus™ acts precisely at this critical point: it reinforces the water's bicarbonate reserve, giving it greater resilience against external disturbances such as phytoplankton photosynthesis, bacterial respiration or the accumulation of carbon dioxide.

The correct technical interpretation is unequivocal: BicarPlus™ **corrects and stabilises the aquatic medium** in which shrimp live, are transported or maintained, also contributing to the crustacean's internal salt balance through the absorption of free sodium ions without chlorine. Its action is regulatory and preventive, not aggressively corrective.

## Ions supplied

$\text{HCO}_3^-$  (bicarbonate) and  $\text{Na}^+$  (sodium), both bioavailable and chlorine-free.

## Main effect

Increased alkalinity and the water's buffering capacity, not direct pH elevation.

## Preferred application

Intensive systems, low-buffer waters, closed ponds and transport.

## 2. Improving the Water's Acid-Base Stability

### Why does the water become acidic?

In intensive aquaculture, water acidification is a continuous process driven by multiple simultaneous factors: respiration of organisms, accumulation of dissolved CO<sub>2</sub>, bacterial nitrification, decomposition of organic matter and cyclical variation in phytoplankton between day and night.

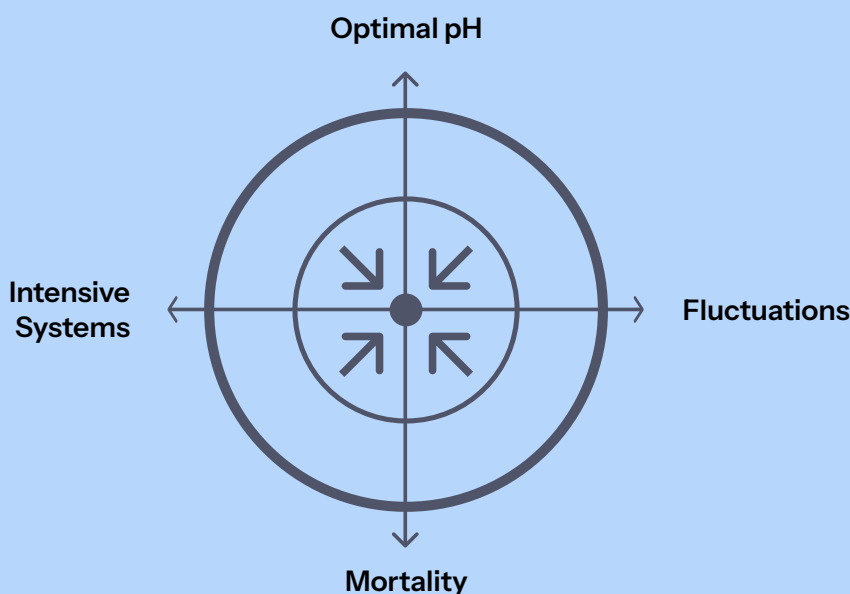
When alkalinity is low, the system loses its buffering capacity and the pH becomes erratic and unpredictable, with direct consequences for the crustacean's survival and productive performance.

### The technical response of BicarPlus™

Intabiotech indicates in its technical documentation that low alkalinity and a pH below 7 rapidly increase crustacean mortality. The addition of BicarPlus™ strengthens the water's buffering effect and helps restore a pH compatible with growth, welfare and survival.

This approach is aligned with the international technical literature: the FAO considers a pH between **7.5 and 9.0** to be generally suitable for shrimp production, although practical management must avoid extremes and abrupt fluctuations. BicarPlus™ contributes precisely to keeping the system within that safe operating range.

- ① The FAO sets an optimal pH range of 7.5 to 9.0 for shrimp production. Abrupt fluctuations outside this range are one of the main mortality factors in intensive systems.



# 3. Support for Salinity Balance and Osmoregulation

Shrimp is an organism highly dependent on the precise balance between external and internal salt concentrations. Osmoregulation — the process by which the crustacean regulates its internal ionic composition in relation to the surrounding medium — requires a constant energy expenditure that rises sharply under adverse conditions.

During transport, high density, or unstable water, the animal experiences sustained osmotic stress. Energy used to compensate for that stress is energy that is no longer available for growth, moulting, and immune resilience. BicarPlus™ supplies sodium and bicarbonate, two components directly useful for supporting the hydroelectrolytic environment and easing the osmoregulatory load on the crustacean.



## Culture Ponds

Support for salinity balance throughout the production cycle, especially in recirculating and biofloc systems where alkalinity is actively consumed.



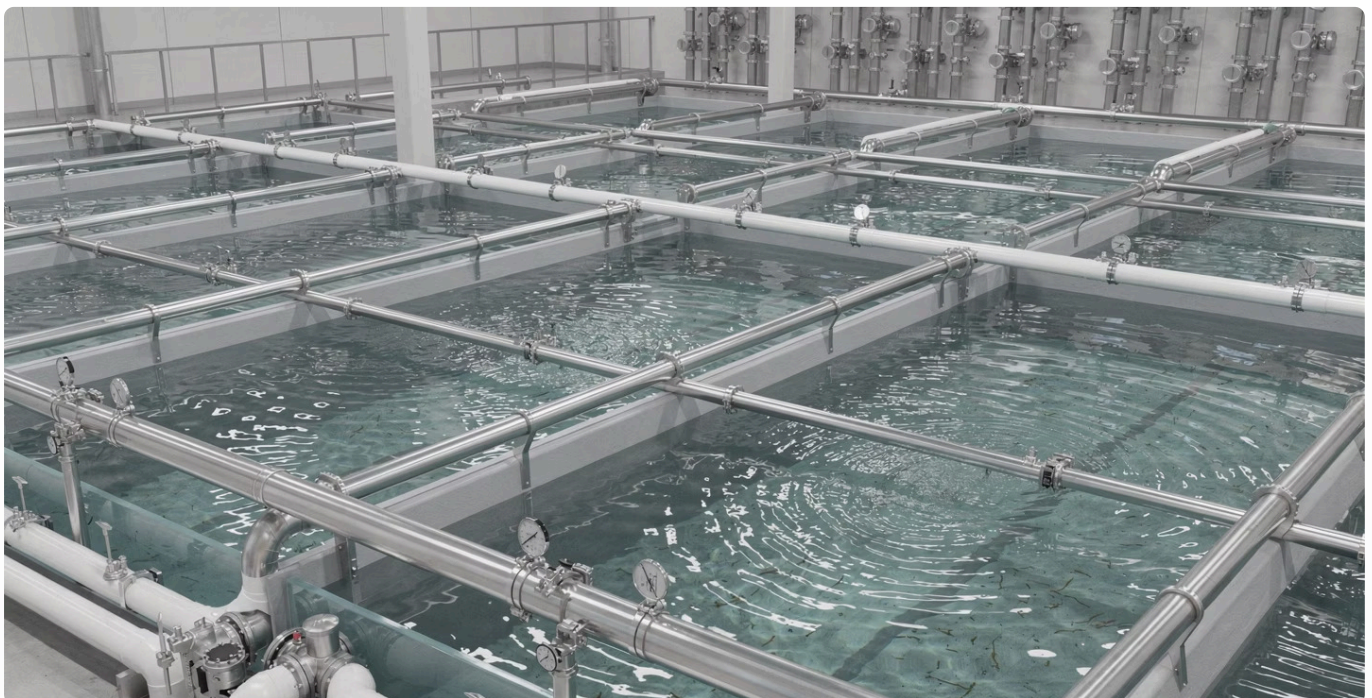
## Transport Water

Reduced osmotic stress when crustaceans travel at high density, helping prevent mortality during transit and in the first hours post-transport.



## Hydroelectrolytic Balance


Supply of Na<sup>+</sup> free from chloride that directly contributes to maintaining the crustacean's internal ionic balance in the face of environmental fluctuations.



# 4. Molting, Growth and Welfare: Essential Fine Control

The shrimp moult — a key physiological process for its growth — depends on an integrated set of variables: minerals, pH, alkalinity, salinity, water hardness, temperature and the animal's physiological state. Any imbalance in this multifactorial system can compromise the success of ecdysis and, with it, overall production performance.

Technical science warns that a pH above 8.3 can make moulting more difficult through salt loss, whilst a pH below 7 is associated with a significant increase in mortality. BicarPlus™, when managed correctly, helps maintain the system within the optimum operating range. However, indiscriminate application can be counterproductive.

 BicarPlus™ should not be added "blindly" to any water. If the system already has a high pH and elevated alkalinity, the addition of bicarbonate may not be appropriate. Its use should always be preceded by water analysis.

## Scenarios where BicarPlus™ adds the greatest value

### Low alkalinity

Water with insufficient bicarbonate reserve to withstand pH variation.

### Unstable pH

Marked night-time oscillations or variations between light and dark cycles.

### Intensive systems and biofloc

Where alkalinity is actively consumed and must be replenished continuously.

### Dilute waters

Freshwater or low-salinity waters with limited natural buffering capacity.

Technical sources recommend maintaining alkalinity and hardness above certain minimum levels in marine shrimp culture. Recent references place alkalinity above **70 mg CaCO<sub>3</sub>/L** for marine shrimp, although in intensive practice higher ranges are often targeted depending on the production system used.

# 5. BicarPlus™ Is Not Antimicrobial Against Vibrio

This point is technically critical and must be communicated precisely to avoid incorrect expectations or inappropriate use of the product. BicarPlus™ may improve water quality by stabilising pH and reducing physiological stress in crustaceans. A less stressed animal shows greater immune resilience and is therefore potentially less vulnerable to opportunistic infections. However, this indirect effect in no way equates to specific antimicrobial activity.

BicarPlus™ is **not a product designed to eliminate, inhibit or control Vibrio** or any other bacterial pathogen. Control of Vibrio in aquaculture requires specific, differentiated and validated strategies: periodic microbiological analysis, water renewal, application of authorised probiotics, specifically approved water treatments and rigorous biosecurity protocols.

## What BicarPlus™ DOES do

It stabilises the aquatic environment, reduces physiological stress in crustaceans and contributes to acid-base balance as part of an integrated welfare strategy.

## What BicarPlus™ DOES NOT do

It does not eliminate Vibrio, does not disinfect the water, and does not replace biosecurity measures, microbiological control or specific analytical verification against pathogens.

- ⊗ BicarPlus™ does not replace specific biosecurity measures, microbiological control, water renewal, probiotics, authorised water treatments or analytical verification against Vibrio or other pathogens.

# 6A. Use in Live Aquaculture: Farming and Transport

The first and clearest area of application for BicarPlus™ is live shrimp: from farming ponds to transport to processing facilities or points of sale. In this context, the product demonstrates its full technical potential as a water-management tool and for crustacean welfare.

In farming ponds, BicarPlus™ acts as a continuous regulator of the acid-base balance, especially relevant in intensive and super-intensive systems where the biological load is high and alkalinity is consumed rapidly. In biofloc systems, this demand for alkalinity is even more pronounced, as nitrifying bacteria consume bicarbonate in their metabolism, making its systematic replenishment essential.

1

## pH Regulator

Maintains pH within the optimum operating range for growth and survival.

2

## Source of Alkalinity

Replenishes the bicarbonate reserve consumed by nitrification and biological processes.

3

## Salinity Support

Contributes to the crustacean's osmotic balance under high-density conditions.

4

## Water Stabiliser

An active management tool in ponds and during the transport of live animals.

## 6B. Post-Harvest Use and Global Technical Recommendation

### Processed shrimp: scope and limitations

In the post-harvest context — washing water, processing, production lines — BicarPlus™ could be used as a gentle adjuster of process water pH. However, in this context it does not constitute a primary or sufficient solution for addressing unpleasant odours, sludge residues, faecal matter, microbiological contamination, or control of *Vibrio* in processed product.

For the specific challenges of post-harvest processing, it is necessary to design a specific and validated technological protocol that includes: washing with water renewal, rigorous cold chain management, possible antioxidant and chelating systems, systematic microbiological control, and sensory validation of the final product.

- ❏ The post-harvest use of BicarPlus™ must be assessed case by case and never replaces a complete technological processing protocol.

### Recommended technical wording

BicarPlus™ is an ultra-pure modified sodium bicarbonate that acts in shrimp water as a bicarbonate buffering system. Its function is to stabilise the alkalinity and pH of the medium, reducing acid-base fluctuations that affect the well-being, moulting, growth, and survival of the crustacean.

By providing bioavailable sodium to the medium, it contributes to maintaining salt and osmoregulatory balance, especially in intensive systems, closed ponds, and high-density transport.

**It should always be applied under control of pH, alkalinity, salinity, temperature, dissolved oxygen, ammonia/nitrite, and organic load. It should not be considered a disinfectant or a direct treatment against *Vibrio*.**

# Conclusion: Technical Positioning of BicarPlus™

BicarPlus™ is a high-purity, precision technical tool for water management in crustacean aquaculture. Its correct understanding, prescription and use require a clear distinction between what the product is, what it does and what it does not do. This technical clarity is the basis of any effective, safe and professionally sustainable usage strategy.

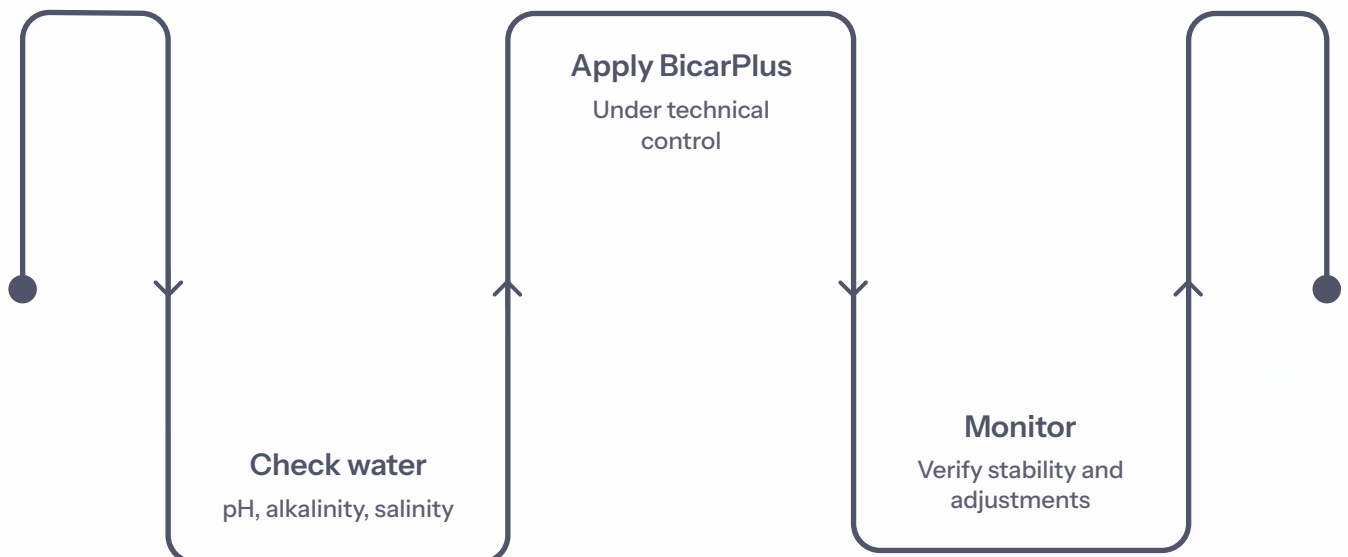
BicarPlus™ in shrimp acts as a "ultra-pure mineral buffer for water stabilisation, alkalinity and salinity balance in crustacean aquaculture". It is not a sensory corrector or antimicrobial agent.

## ✓ It is

- High-purity bicarbonate buffer
- pH regulator and stabiliser
- Source of alkalinity for aquaculture systems
- Support for salinity/osmoregulatory balance
- Management tool in farming and transport

## □ It is not

- Antimicrobial or disinfectant
- Specific treatment against Vibrio
- Post-harvest sensory corrector
- Replacement for biosecurity protocols
- A universal solution applicable without prior analysis



Professional application of BicarPlus™ always requires a prior analysis of the water — pH, alkalinity, salinity, temperature, dissolved oxygen, ammonium and nitrite — and subsequent monitoring of the parameters. Only under this rigorous technical control scheme can the product's efficacy and the safety of the production system be guaranteed.

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Our team is ready to assist you



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