

The Science of Sustained Efficacy: ChloroKlean Plus L20

Advanced Oxidation Technology for PT4 (Food & Feed) and PT5 (Drinking Water) Applications.



Regenerative Biocide Technology | Liquid Phase Chemistry | Verified Efficacy

Executive Summary: The Regenerative Advantage



The Industry Challenge

Traditional biocides (Sodium Hypochlorite, Chlorine Dioxide Generators) suffer from rapid chemical depletion (gas-off), high corrosion rates on infrastructure, and expensive CAPEX/maintenance.



The ChloroKlean Solution

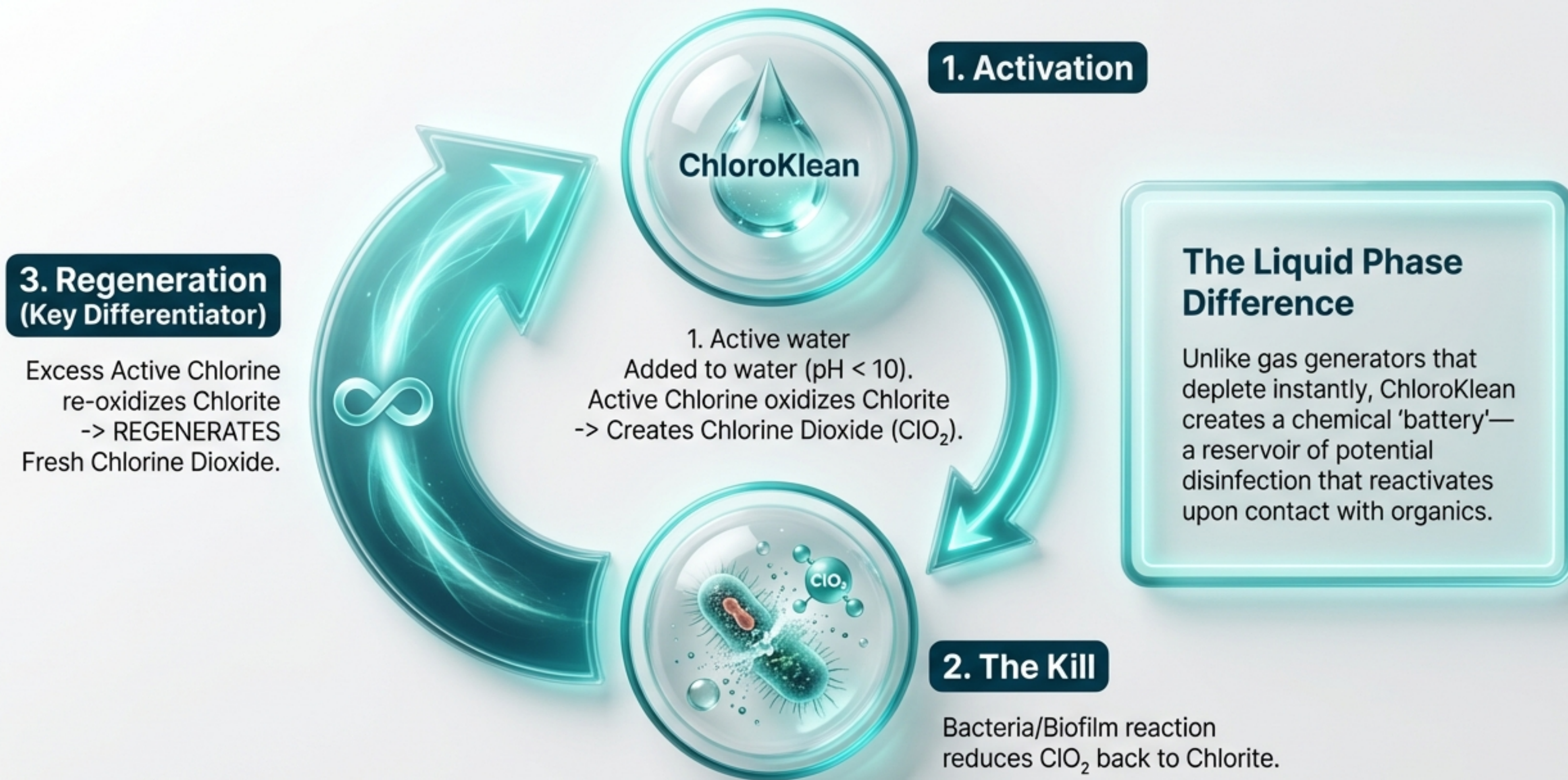
Liquid-Phase Regenerative Chemistry. Features stabilized Sodium Chlorite & Hypochlorite that generates Chlorine Dioxide in-situ (Liquid Phase). Creates a "Reservoir" of disinfection potential that is thermally stable with prolonged residual.



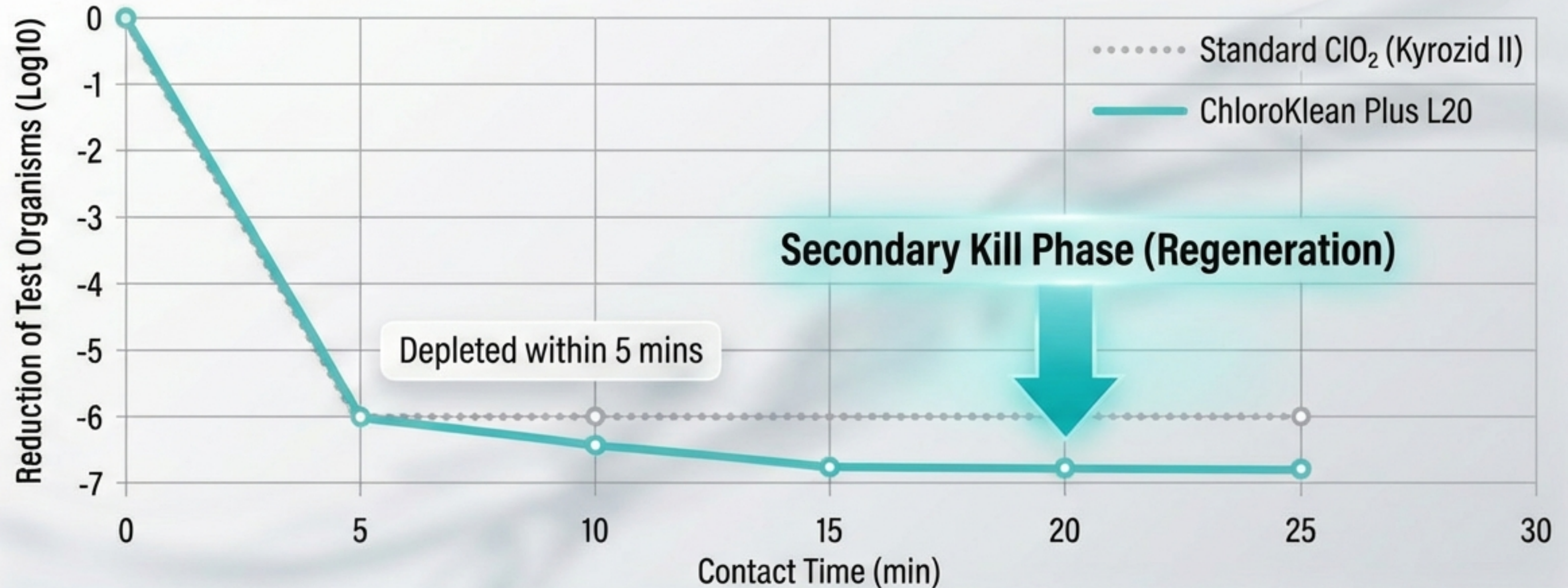
Validated Results

- PT4 (Food): 99% reduction in chemical volume (Poultry Case Study).
- PT5 (Water): Successful Legionella removal where thermal controls failed.
- Efficacy: >5.9 log reduction in bacteriophages (Exceeds EN standards).

The Regenerating Engine: How Liquid-Phase Chemistry Works



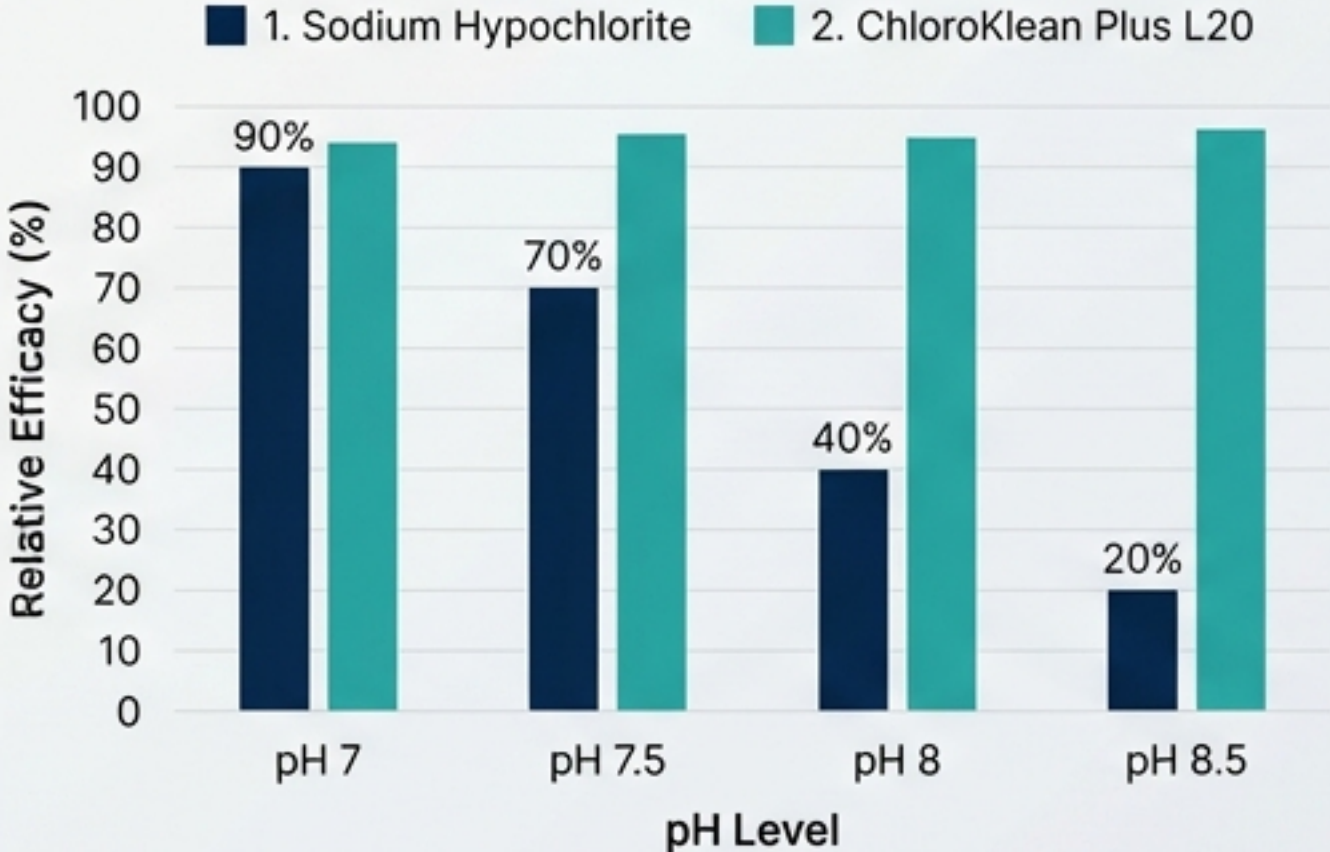
Comparative Efficacy: Sustained Activity vs. Rapid Depletion



Evidence of Regeneration: The further reduction between 10-25 minutes proves that new Chlorine Dioxide is being generated in-situ, ensuring safety throughout long distribution pipework.

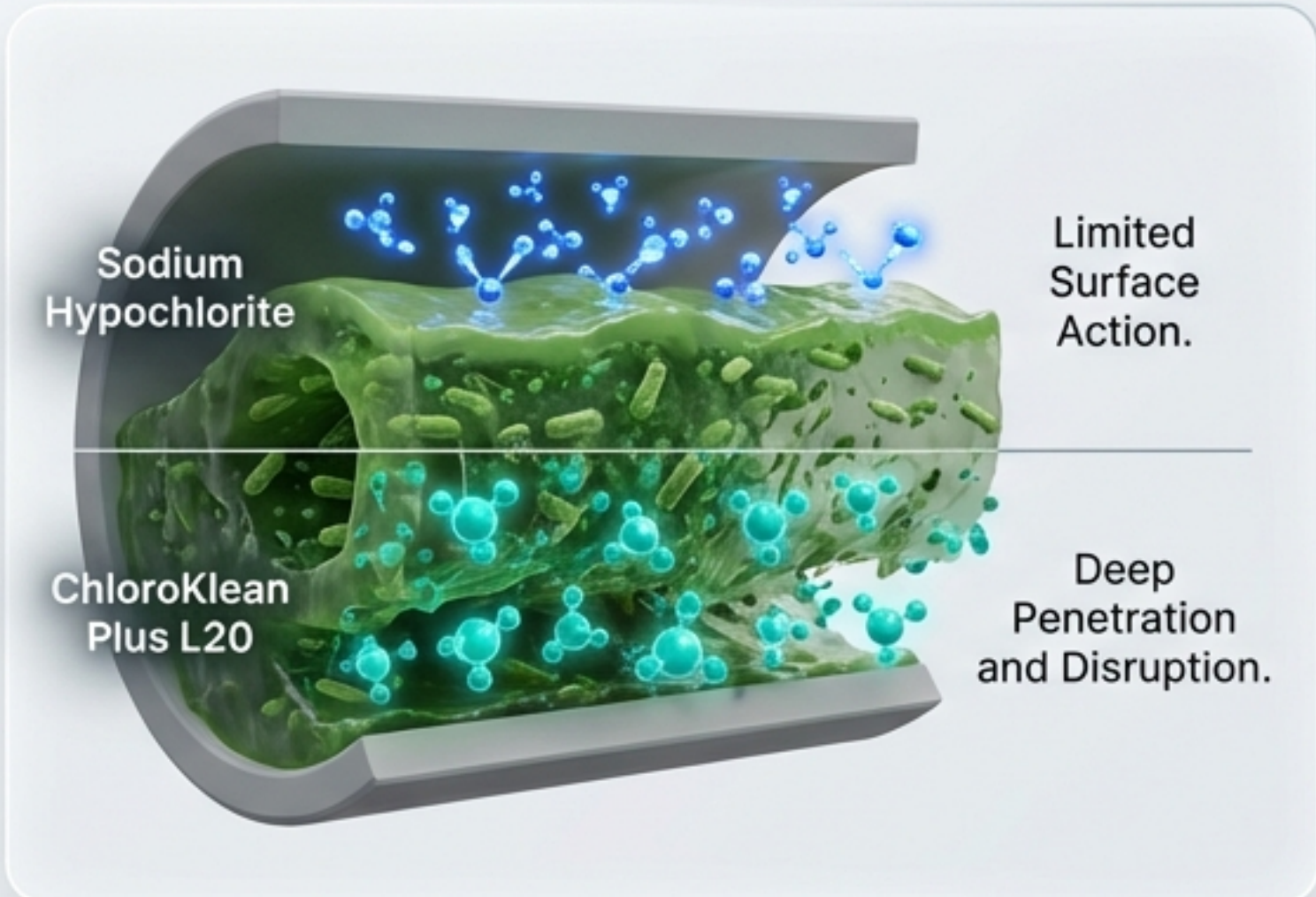
Superiority in Biofilm Removal and pH Stability

pH Independence



ChloroKlean maintains high efficacy regardless of pH fluctuations.

Biofilm Penetration



End-of-life ChloroKlean outperforms 10x stronger Sodium Hypochlorite in biofilm removal.

PT4 Application: Food & Feed Area Disinfection

Scope of Compliance

- **Approvals:** Direct & Indirect Food Contact Surfaces.
- **Sectors:** Dairies, Breweries, Meat & Poultry Processing, Bakeries.

Target Organisms



Listeria monocytogenes



Salmonella spp.



E. coli



Viruses.

Operational Benefits

- Stable in CIP (Clean-in-Place) systems.
- No rinse required (at appropriate dosages).
- Non-corrosive to stainless steel equipment.

PT4 Case Study: Solving Chemical Overload & Bacterial Failure

The Problem



- Manual handling of 1000L of chemicals.
- Frequent E. coli / Coliform failures.
- Heavy corrosion on stainless steel.

**99%
Reduction
in Chemical
Volume**

1000L → 10L

The ChloroKlean Result



Switch to continuous low-level ChloroKlean dosing.

✓ Zero bacterial failures since implementation.

✓ Corrosion and foaming eliminated.

PT5 Application: Drinking Water & Distribution

Compliance Scope

- Potable Water Treatment
- Hospital Water Systems
- Private Supplies (Wells/Boreholes)
- Legionella Control



PT5 Case Study: Major Hospital Water Safety

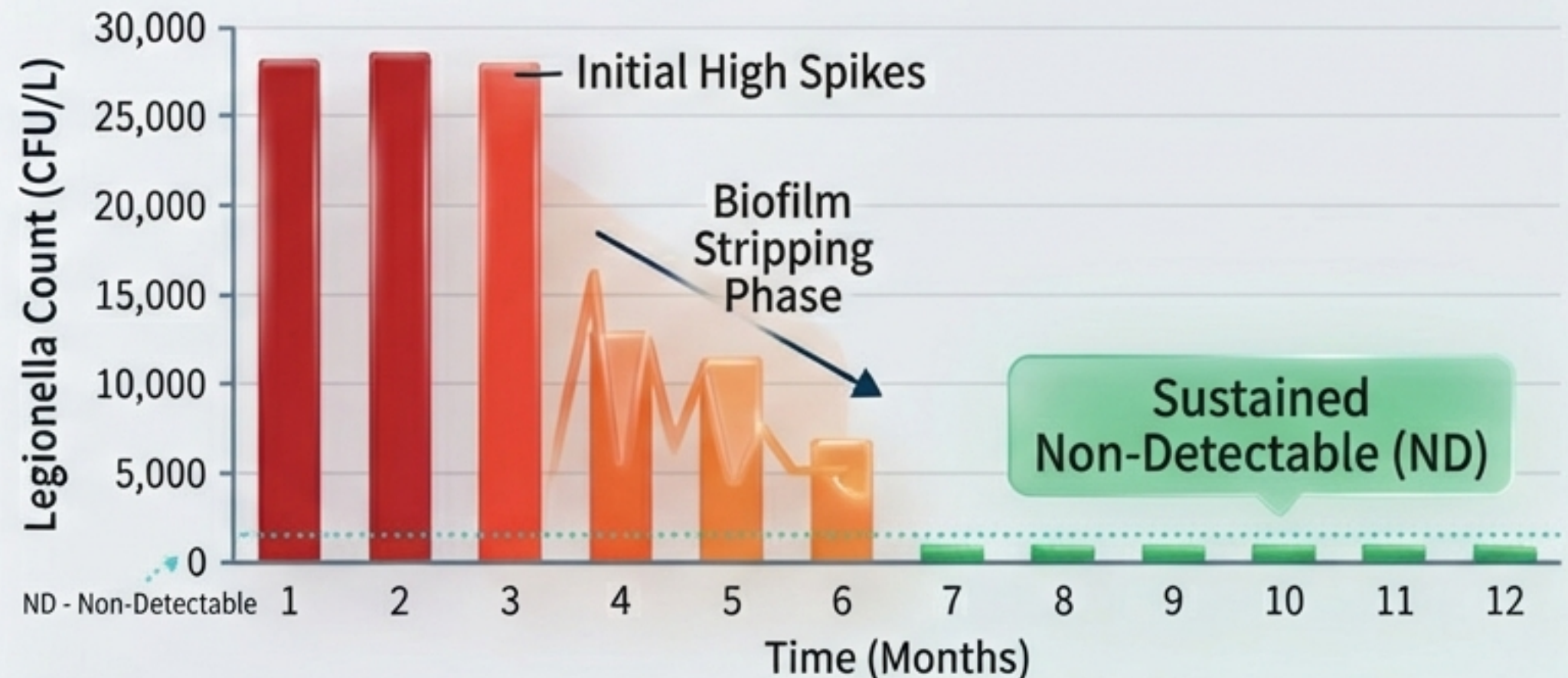
Eradicating Legionella in Critical Care Environments

The Challenge:

Persistent *Legionella Pneumophila* SG1 in hot & cold systems.

Thermal controls and standard flushing failed due to biofilm in aging infrastructure.

The Results (Graph):



Key Insight:

Initial fluctuations are positive—proving the chemical is stripping the habitat (biofilm) from the pipes, followed by sustained safety.

Scientific Validation: Independent Laboratory Verification

Compliance with EN Standards for Drinking Water (Verified by SUT Simulated Use Test).

Organism	Log Reduction (10 mins)	Standard Requirement	Result
E. coli	> 4.5 log	> 2 log	✓ PASS
Enterococcus faecium	> 3.9 log	> 2 log	✓ PASS
Bacteriophage MS2	> 5.9 log	> 2 log	★ EXCEEDS STANDARD

Report validated by SUT Simulated Use Test GmbH according to UBA/ECHA guidelines.

Broad-Spectrum Efficacy Redefined



Bacteria Efficacy

ChloroKlean Plus L20		Very High
Bromine		Very High
DCCA/TCCA		High
Calcium Hypochlorite		High



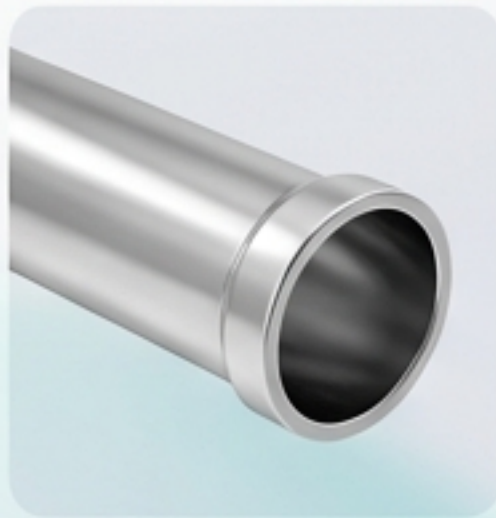
Virus Efficacy (Enteric, SARS, COVID)

ChloroKlean Plus L20		Very High
Bromine		High
DCCA/TCCA/Hypo		Low to Moderate



Key Differentiator: ChloroKlean's multi-oxidant mechanism targets not just DNA but also RNA. This makes it uniquely potent against RNA viruses like Coronaviruses, where traditional chlorine and bromine are less effective.

Material Compatibility & Safety Profile



Infrastructure Safety

Compatible with Stainless Steel, PVC, PE, PP, EPDM, Viton.

Significantly lower corrosion rate than Sodium Hypochlorite or Peracetic Acid.



Operational Safety

No On-Site Generation:
Eliminates mixing of dangerous precursors or pressurized gas.

Toxicity Risk & DBPs

Disinfectant	Common DBPs	Toxicity Risk
ChloroKlean Plus L20	Chlorate	Low-Moderate
Bromine	Brominated THMs, Bromate	Moderate-High
Calcium Hypochlorite	THMs, HAAs, Chlorate	High

Operational Economics & Efficiency



Shelf Life

12-18 Months stability. Outlasts activated ClO₂ (short half-life). Reduces waste and simplifies inventory.



Dosage Efficiency

Low volume dosing: ~0.6 ml/m³ for Potable Water. Drastic reduction in storage footprint and transport costs.



Asset Protection

Biofilm removal extends heat exchanger and valve life. Reduces 'shock dosing' damage common with other biocides.

A Single Solution for Diverse Water Systems



Potable



Swimming Pool



Cooling Tower



Process Water

Application	Typical Dosage (ml/m ³)	Total Chlorine (mg/l)
Potable Water	10 ml/m ³	Total Chlorine 0.6 mg/l
Swimming Pool/Spa	430-860 ml/m ³	Total Chlorine 1.8-2.4 mg/l
Evaporative Cooling Tower	(15-20)/C	Total Chlorine 0.9-1.2 mg/l
Process Water	20-100 ml/m ³	1.2-6.0 mg/l

One Product: Continuous Dose, Shock Dose, and CIP. A versatile, single-drum solution for a wide range of applications.

The ChloroKlean Plus L20 Advantage: The Smart Choice



Sustained Efficacy

Regenerating Engine provides prolonged residual and deep biofilm penetration.



Superior Safety

Minimal harmful DBPs (THMs).
No dust, fire, or explosion hazards.



Operational Simplicity

Easy-to-dose liquid, low odor, long shelf life.