



LANXESS
Energizing Chemistry

Introducing LANXESS F&F — the Leader in Consumer-Friendly HI&I Preservation

April 20, 2022

Agenda



Holger Hueppeler

General Manager

- **Introduction to LANXESS Flavors & Fragrances business unit**



Rosanna Stokes

Americas Business Development Manager

- **HI&I Market Trend Analysis and the Need for Sustainable Solutions**



Dr. Amber Yarnell

R&D Scientist

- **Best Practices and Methodologies for Green HI&I Preservation**

Part of the Growing Consumer Protection Pillar

Advanced Intermediates	Specialty Additives	Consumer Protection	Engineering Materials
			
<ul style="list-style-type: none">▪ Advanced Industrial Intermediates▪ Inorganic Pigments	<ul style="list-style-type: none">▪ Lubricant Additives Business▪ Polymer Additives▪ Rhein Chemie	<ul style="list-style-type: none">▪ Liquid Purification Technologies▪ Flavors & Fragrances▪ Material Protection Products▪ Saltigo	<ul style="list-style-type: none">▪ High Performance Materials▪ Urethane Systems

With the acquisition of Emerald Kalama, LANXESS has formed a new business unit within the Consumer Protection segment, called Flavors & Fragrances (F&F).

Introducing LANXESS Flavors & Fragrances (F&F)

New business unit for sustainable, high performance solutions for global consumer product brands
(created following the acquisition of Emerald Kalama Chemical)



Broad portfolio of sustainable solutions

Antimicrobials, aroma ingredients, multifunctionals, and intermediates



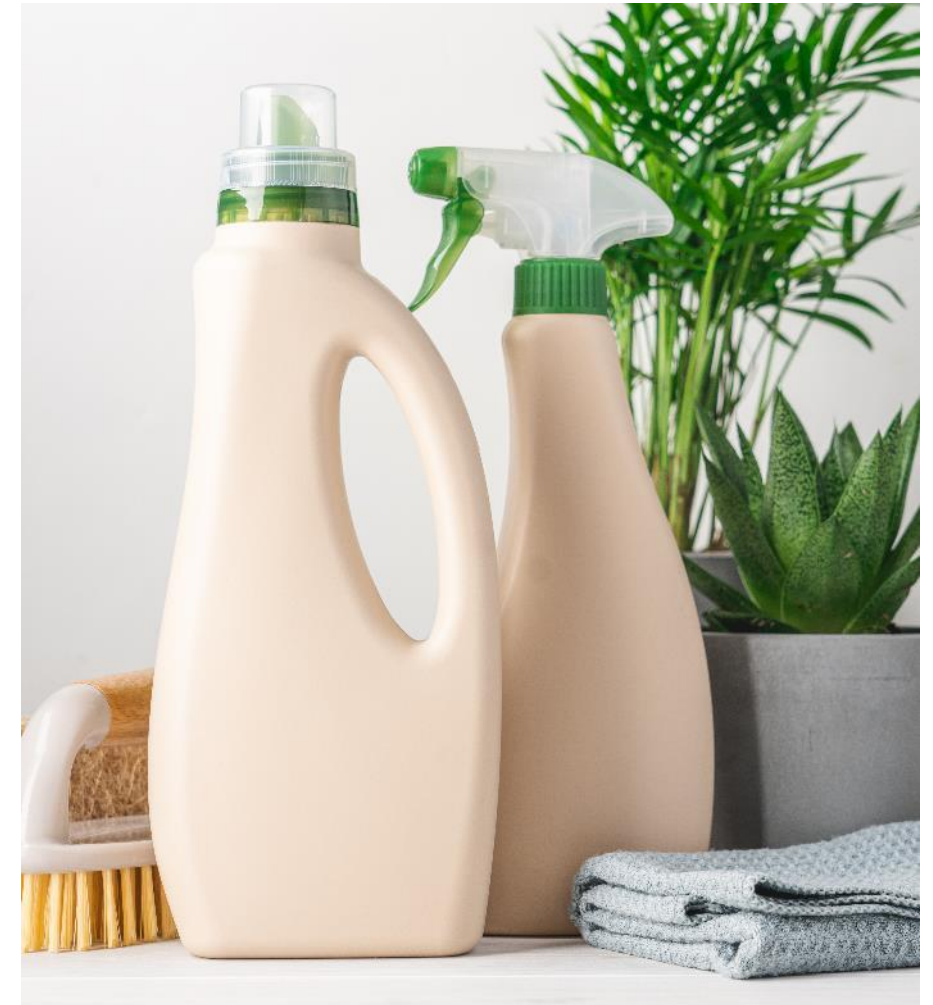
Advanced technical and regulatory expertise

Optimizing formulas to be more sustainable, robust, skin-friendly, and high performing



Highest standards for quality, safety & reliability

Nature identical, high purity ingredients produced by a responsible leading producer



Flavors & Fragrances Global Reach

Using the highest quality standards at our facilities in the USA, Europe, and Asia

Headquartered in Cologne, Germany

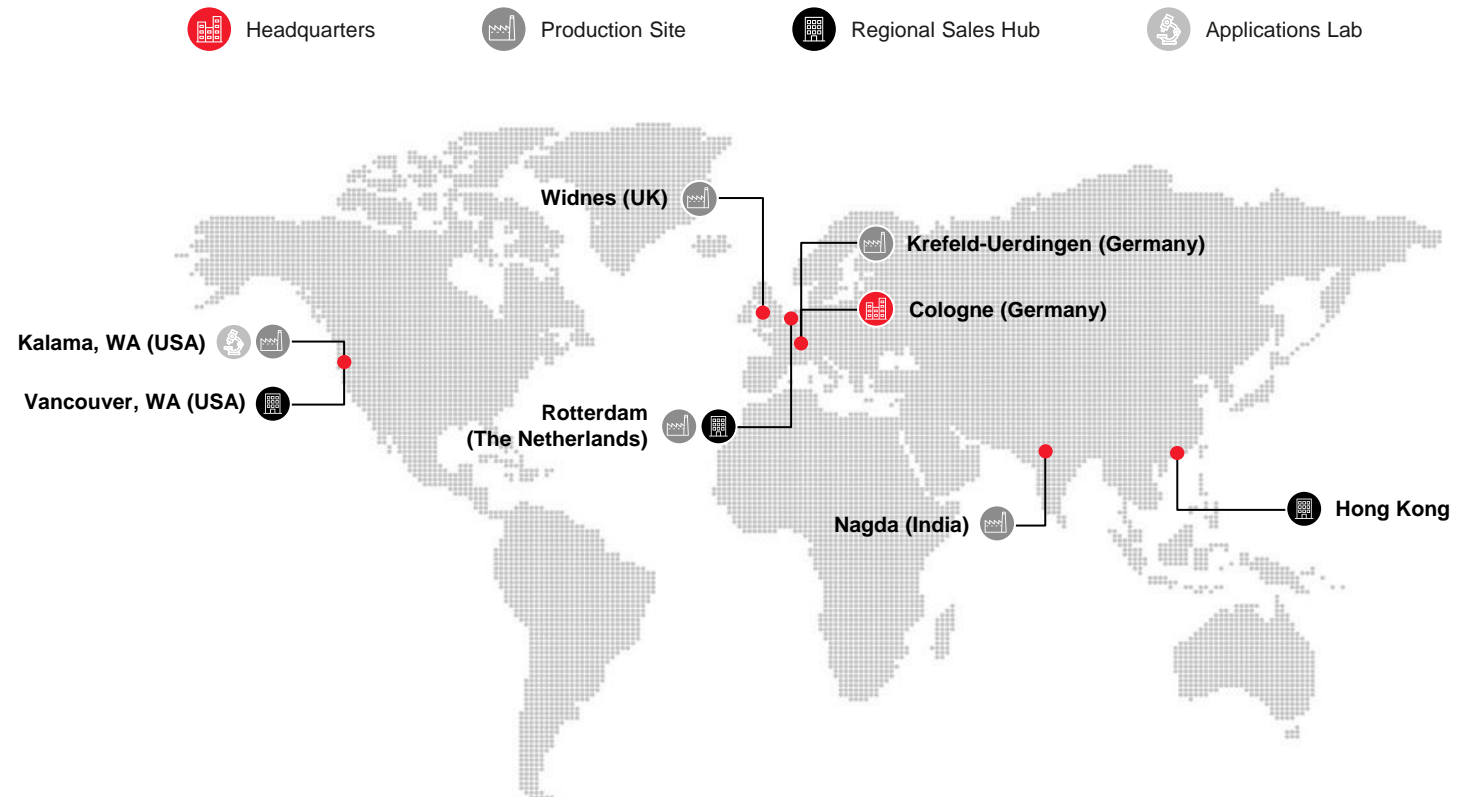
■ 5 production sites

- Backward integrated in benzoic acid and benzaldehyde, offering a strategic advantage
- Multiple production locations for key products
- Certified to meet the highest industry standards for quality and HS&E

■ ~70 products

■ ~800 employees

■ Worldwide sales and distributor network



F&F's Trusted Family of Brands

Benzoates & Antimicrobials

Purox[®]

The highest purity benzoates
available worldwide

 **Kalaguard**[®]

The only BPR registered
sodium benzoate preservative

X Solbrol[®]

Effective preservatives for
every formulation

Fragrance, Functionality & Freshness

X Purolan[®]

High purity multifunctionals and
aroma ingredients

Kalama[®]

High purity, consistent aroma
ingredients and benzoates

Markets We Serve



Household Care



Personal Care



Fragrance



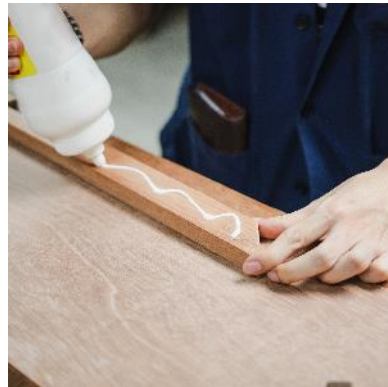
Food & Beverage



Animal Nutrition



Agriculture



**Adhesives &
Sealants**



Coatings



Intermediates



And more...

Unique Value Proposition



Purity

**Nature identical ingredients with min. assays
97.0 – 99.98%**



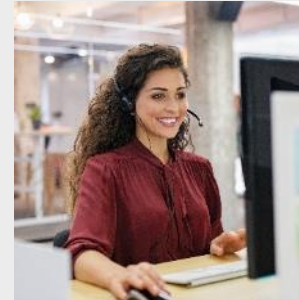
Responsibility

**SEDEX, EcoVadis
Climate Neutral 2040 initiative
Sustainable ingredients**



Quality

**Low color / odor impact
Raw material efficiency**



Fast Response

**Acknowledgements, price quotes, customer
questions, technical support**



High Standards

**FSSC 22000
ISO 9001:2015
ISO 14001:2015**



Short Lead Times

**Excellent service with sites worldwide, dual
production for key ingredients, and global
warehousing and distribution partners**

LANXESS Sustainability Targets



Climate Neutral 2040

We will cut CO₂e emissions by 75% from 2004-2030 and be carbon neutral by 2040. We are pursuing this target in an ambitious and forward-looking manner by **reducing greenhouse gas emissions** and introducing **process and technology innovations**.



Energized employees & performing teams

Our success is driven by **each employee's commitment**, aligning with our slogan, "Energizing Chemistry." We incorporated our values into "Formula X", which is instilled in our daily work: keep it simple, take ownership, act as a team, think new, and act fast.



Climate protection & energy efficiency

Climate protection and energy efficiency are not only critical to the **environment and people**, but are also key to **long-term economic performance and corporate success**.



Safe and sustainable sites

We focus on **safely and responsibly manufacturing** products, making **continuous process improvements and investments**. We also work with members in the local communities where we operate to be a **reliable partner and societal contributor**.



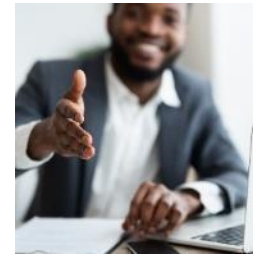
Sustainable Product Portfolio

Our products are carefully manufactured to **minimize impacts on human health or environmental harm**. We systematically evaluate the sustainability of our portfolio and apply **sustainability criteria in the development of products and applications**.



Business-driven innovation

We work with customers and suppliers to drive process, product, application, and business model innovations. We **support our customers in making their business sustainable**, achieving continued success and operational improvements together.



Valuing customer relationship

Long-term customer relationships are important to us. These partnerships are based on mutual trust. LANXESS works tirelessly to recognize, understand, and meet our customers' requirements with a goal of **customer satisfaction, loyalty, and joint success**.



Resilient Sourcing

As a founding member of the "Together for Sustainability" initiative, we aim to improve transparency and sustainability throughout our supply chain and ensure suppliers abide by **uniform standards for human rights, safety, environment, and business integrity**.

What Does Consumer Protection Mean to F&F?



The highest standards for quality and safety

- **High purity** portfolio
- **Rigorous ISO schemes** for consistent management of quality and safety
- **FSSC 22000 and HACCP certified** food-grade operation schemes



Robust, consumer friendly preservation

- Protect consumers from the hazards associated with **microbial contamination**
- Focus on eliminating hazards related to **skin sensitization or irritation**
- **Innovation and regulatory expertise** to widen the preservative palette



Sustainable solutions to help preserve our future

- Portfolio of **nature identical, palm oil free, and readily biodegradable** ingredients
- **Responsible production**, with clear sustainability targets and globally recognized certifications and schemes
- **Optimizing customers' formulas** to maximize sustainability



**HI&I Market Trend Analysis and
the Need for Sustainable Solutions**

Rosanna Stokes, Business Development Manager

What's on Consumers' Minds?



“How do I keep myself and my children safe and healthy?”



“Can I trust the safety of my cleaning products?”

“How can I help preserve the environment for the future?”

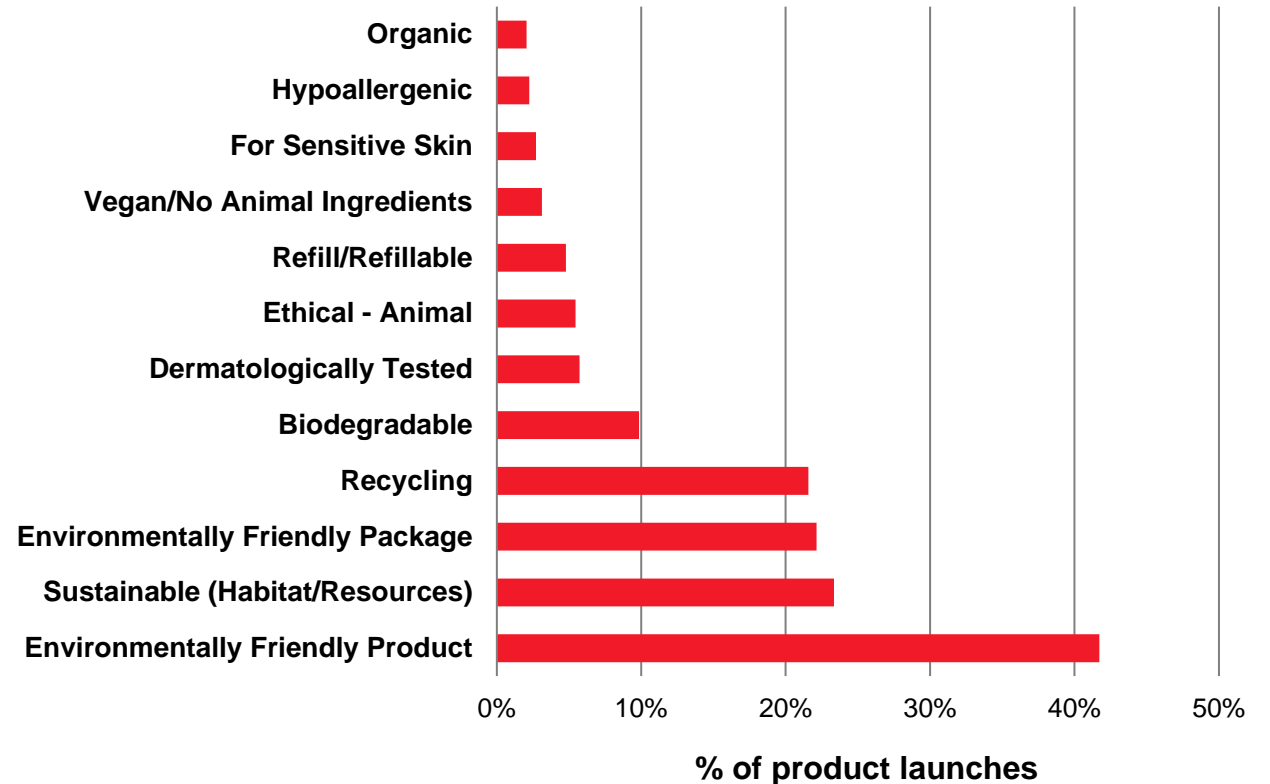
“How do I know which products reflect my values for sustainability and wellness?”



Household Market – Growth and Drivers

- **Strong growth: Cleaning and sanitizing** have become a top priority. (Sales grew **5% in 2020** vs. pre-COVID forecast of 2%.)¹
- **Consumer trends:**
 - Associating cleaning with **safety and health**
 - Paying more **attention to composition**
 - Selecting products that match their values for **wellness and environment**
- **Sustainability: GC3 — Green-marketed products “significantly outperform their conventional counterparts in consumer markets.”**²
 - **EPA Safer Choice CAGR 2015-2019: 10.4%**
 - vs. overall category performance: **1.45%**²

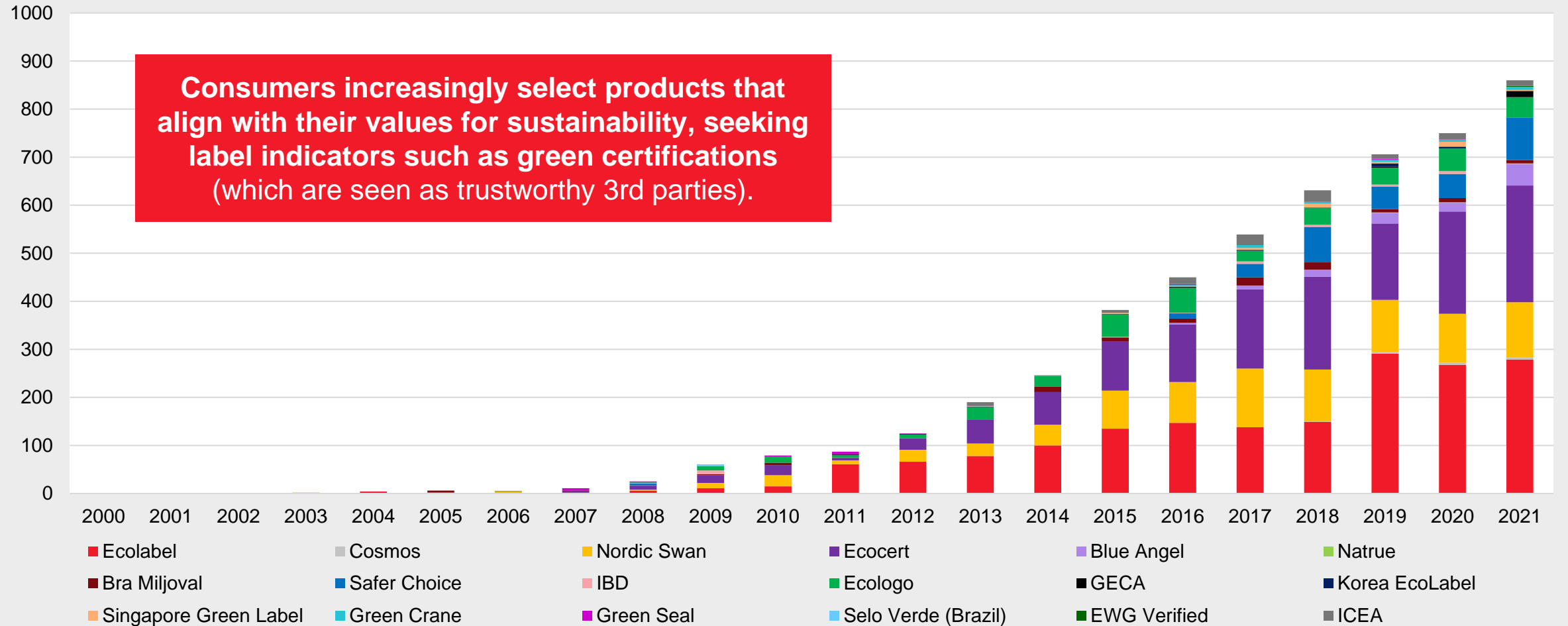
Label claims on household product global launches 2016-2021



Sustainability, wellness trends, and more frequent cleaning are increasing demand for green products.

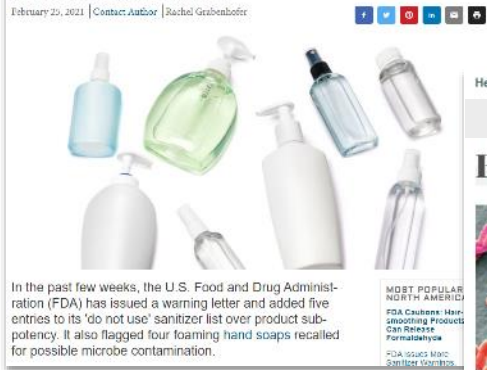
The Rise of Green Labels

Green Certification Product Launches in Home Care Products



Protect Consumers & Brands

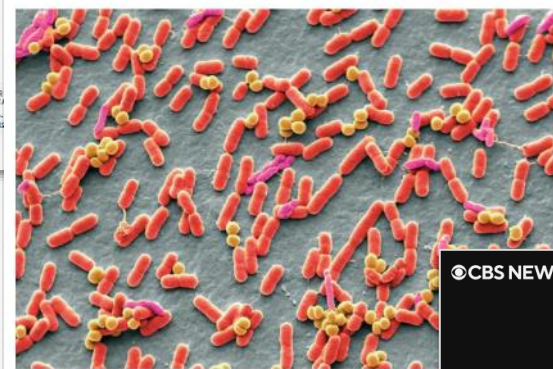
Cosmetics & Toiletries FDA Issues More Sanitizer Warnings, Posts Microbe-related Recalls



Multiple Dry Carpet Cleaner Brands Recalled for Bacteria Contamination

The powder could cause respiratory infections in some individuals.

Moisturizer Recalled Due to Bacteria Risk



MONDAY, March 21, 2022 (HealthDay News) – Before slathering moisturizer, check the label. Certain lots have been recalled because they were contaminated with bacteria that pose a risk to people with weak immune systems.

Baby Bottle Soap Recalled Due to 'Harmful Bacteria'

By RACHEL LEWIS
August 31, 2017 8:19 AM EDT

Lab finds benzene in 78 sunscreens and sun-care lotions

Known carcinogen was present in a broad cross-section of brands and product types. The independent analytical laboratory Valsura says it has found traces of benzene in

CDC confirms deadly bacteria in home spray recalled by

By KATE GIBSON
OCTOBER 28, 2021 / 2:24 PM / MONEYWATCH

CONSUMER WATCH 10 Brands of Baby Wipes Recalled Due to Possible Bacteria Contamination



September 5, 2016 - Cairns, QLD, Australia
Just a reminder to parents to check your wipes when using them... I usually buy [brand], but decided to try the [brand]. This is the 3rd packet I've opened with mold in it. I only noticed cause I open the packs & put them in a container. I'll be using the rest of this box for cleaning 🙄



FDA Cosmetics @FDACosmetics
#RECALL: [redacted] recalls [redacted] Wipes due to discoloration issues. For your safety, discontinue use of all recalled product, and report any reactions to @FDAMedWatch. go.usa.gov/xEU5n
6:59 AM - 15 Mar 2019

Poor preservation efficacy and ingredient quality can damage brands erode consumer trust. Green-seeking consumers are rarely willing to sacrifice on perceived product quality or efficacy.

Kalaguard[®] SB preservative for home care

LANXESS
Energizing Chemistry

BPR registered/EPA FIFRA approved sodium benzoate

Sustainable

Nature identical, readily biodegradable

Listed by EU Ecolabel and other green certifications

Gentle

Classified as non-irritating to the skin

Odorless and non-discoloring

Effective

Cost-effectively preserves formulations – up to pH 7.0



Broad Efficacy in Formulations up to pH 7.0



Multipurpose Cleaners



Hand Dishwash Liquid



Cleaning Wipes



Laundry Detergents



Fabric Softeners



Raw Materials



Automotive Care



Bathroom Cleaners



Kitchen Cleaners



Rinse Aid



Toilet Gel



Descaler



Leather Polish



Floor Care



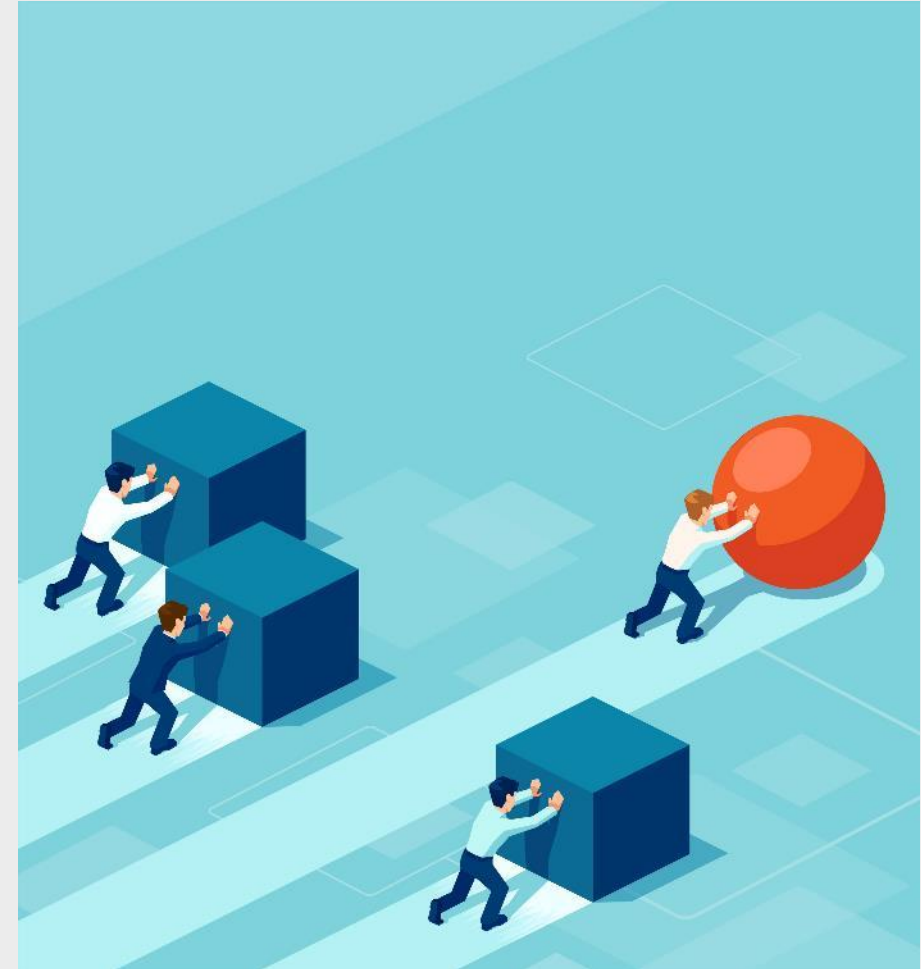
Stain Remover

EPA FIFRA and BPR registered, including all states and member states. Already adopted in over 200 commercial products.

Optimize the Formulation to Maximize Use of Green Preservatives

It is possible to **enhance preservation efficacy of organic acids such as Kalaguard® SB** in challenging applications by adjusting the formulation.

- **Develop preservation solutions in the initial formulation planning**
- **Lower pH, narrow the manufacturing specification. With the right formulation components, Kalaguard® SB can work up to pH 7.0.**
- **Add preservation boosters, such as:**
 - Chelators
 - Emerald® X7
- **Understand how surfactants impact preservation efficacy**
- **Engage your suppliers for innovation and formulation solutions**



Summary of HI&I Market Trends



Label Transparency

Increasing scrutiny by consumers, regulators, and NGO's



Demand for high purity ingredients with a safe and natural profile



Sustainability

Label claims & certifications for eco-friendly products rising – sustainability is no longer a niche category



Demand for ingredients suitable for eco-conscious formulas and green certifications



Ingredient Restrictions

Fewer options as many classical chemistries are scrutinized, such as sensitizers and irritants



Demand for robust preservatives / multifunctionals that are dermatologically safe



Supply Chain Challenges

Bottlenecks, regional issues, and high demand disrupt supply chain for key materials



Demand for consistent supply from a reliable, strategically located supplier

LANXESS F&F is ideally situated to meet these needs, with a consumer friendly, eco-conscious portfolio and innovation to help manufacturers optimize their formulas to meet demand

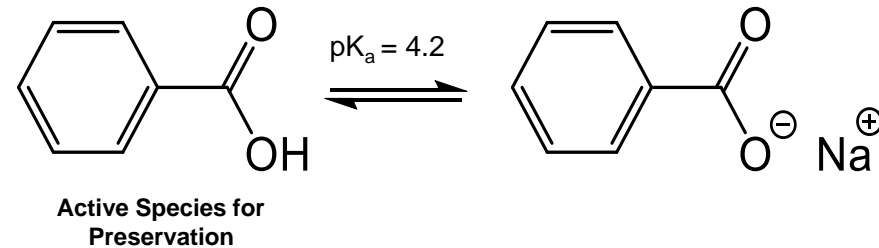


Best Practices and Methodologies for Green HI&I Preservation

Dr. Amber Yarnell, R&D Scientist

Sodium Benzoate – Organic acid preservative

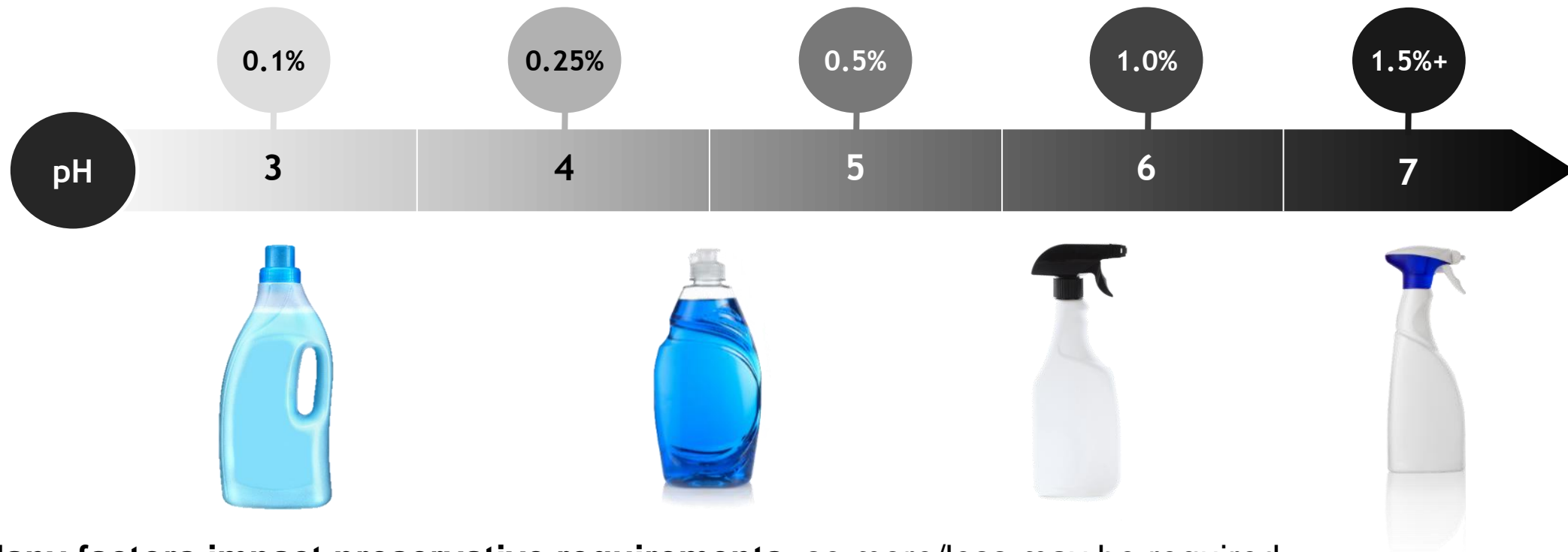
pH must be considered when using sodium benzoate



Acidic environments favor higher activity of the acid preservative.

How can I use Kalaguard® SB sodium benzoate?

Starting point recommendations for home care formulas to effectively control bacteria and fungi.

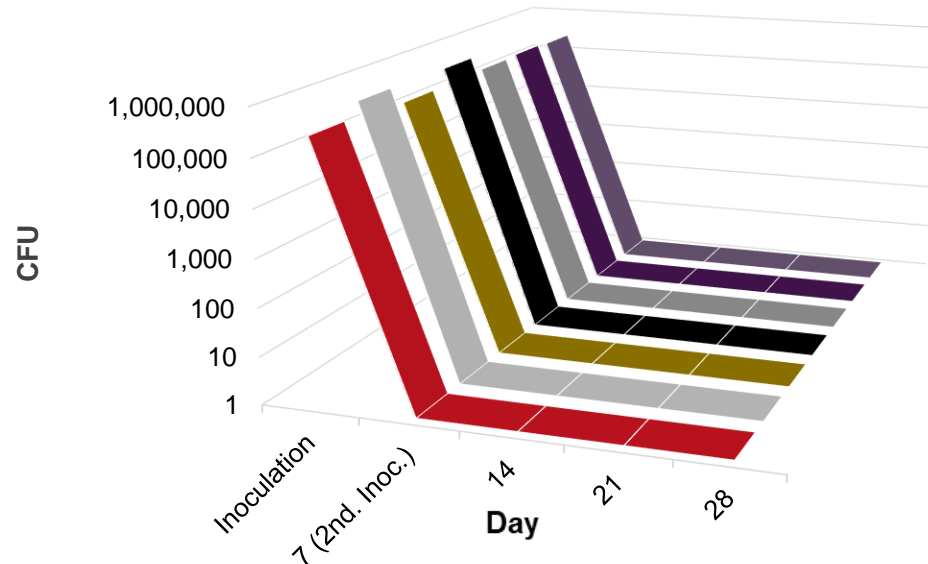


- **Many factors impact preservative requirements**, so more/less may be required.
- LANXESS works with manufacturers to optimize full formulas to be more robust and **leverage synergies with ingredients** such as surfactants and Emerald® X7.

Classic Formulas

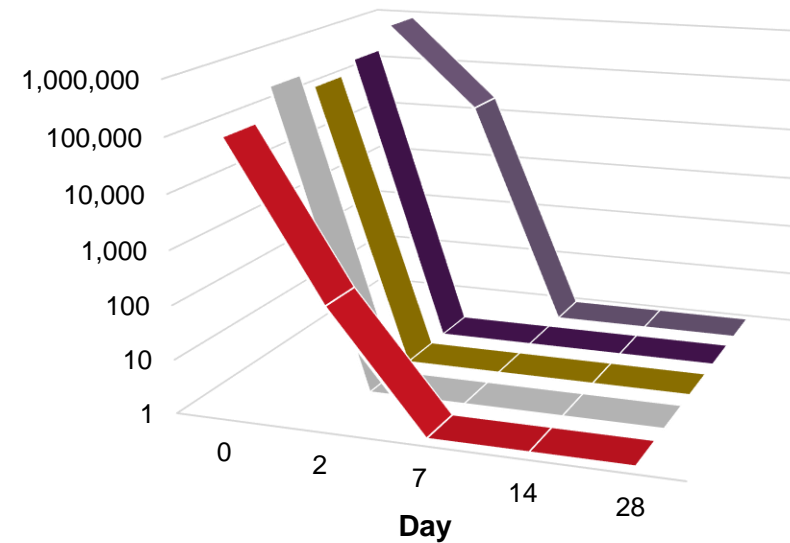
Fabric Softener

0.1% Kalaguard® SB, pH 3.0



Biodegradable Hand Dish Product

1.0% Kalaguard® SB, pH 6.0



■ *E. coli* ■ *S. aureus* ■ *P. aeruginosa* ■ *C. albicans* ■ *A. brasiliensis* ■ *A. aceti* ■ *B. cepacia*

Kalaguard® SB is effective against a broad range of bacteria, yeast, and mold.

Formulate Innovative Products with Kalaguard® SB

Solid Products

- Solid tablets or sachets are designed to be dissolved by consumer at home, reducing packaging & shipped water.
- Protection with **Kalaguard® SB** starts as soon as water is added.



Probiotic Technologies

- Actively clean surfaces for days
- Establishes healthy home microbiome
- **Kalaguard® SB** is compatible with many probiotic cleaning technologies.



TRENDING

- Fragrance encapsulates are used to provide long-lasting freshness.
- Nature-identical **Kalaguard® SB** can protect encapsulated fragrances in manufacturing process.



Encapsulated Solutions

- From surfactants and polymers to rheology modifiers and enzymes, extending shelf life can reduce waste.
- **Kalaguard® SB** protects water-based raw materials up to pH 7.0.



Water-Based Raw Materials

Solid Concentrated Cleaners ft. Kalaguard® SB

A Sustainable Alternative Format

- Reduced packaging, less shipping volume
- Consumer dilutes solid product at home using clean reusable bottles
- Solid can be pressed into tablet form or packaged loose as a sachet
- Effervescent action aids in dissolution, no mixing necessary
- Buffer system is important to ensure desired final product pH
- Effective preservation is necessary to protect the quality of the diluted cleaner

Acidic Bathroom Cleaner, pH 3.5

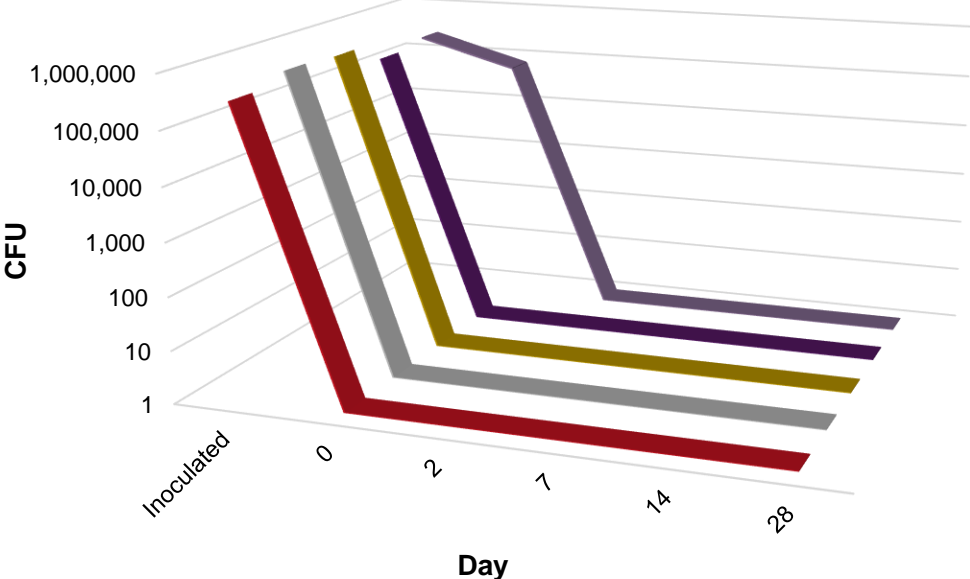
Ingredient	Wt.% solid	Wt.% of dilute solution
Sodium Lauryl Sulfate	34.9%	0.44%
Sodium Alpha Olefin Sulfonate	11.6%	0.15%
Kalaguard® SB Sodium Benzoate	8.1%	0.10%
Sodium Gluconate	9.3%	0.12%
Sodium Carbonate	3.5%	0.04%
Citric Acid	29.1%	0.37%
Fragrance	3.5%	0.04%

To prepare cleaning solution: Dissolve 10 g solid in 1000 mL tap water.

Solid Concentrates: Bathroom Cleaner

Kalaguard® SB sodium benzoate provides broad-spectrum preservation to the diluted formula.

**Bathroom Cleaner, pH 3.5
0.10% Kalaguard® SB**



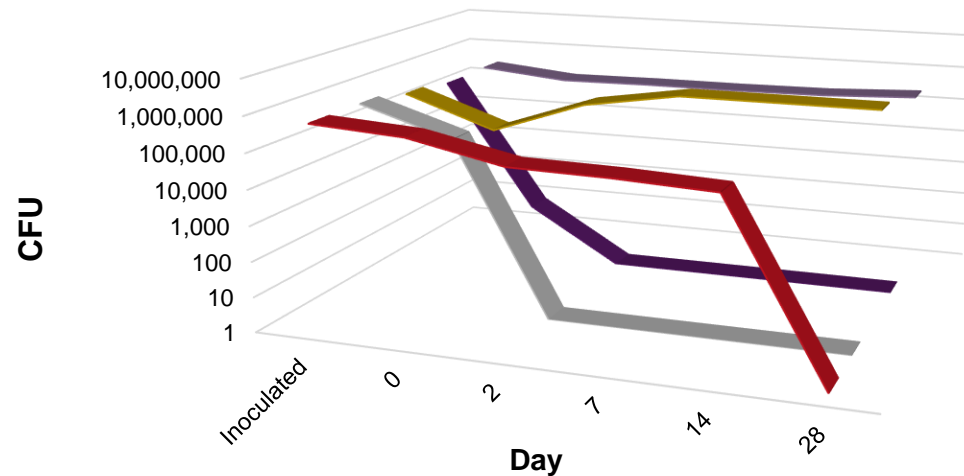
- Bacterial control
- Fungal control

■ *E. coli* ■ *S. aureus* ■ *P. aeruginosa* ■ *C. albicans* ■ *A. brasiliensis*

Solid Concentrates: Commercial Bathroom Cleaner

Solid concentrates formulated without a preservative risk contamination of diluted product.

Commercial Product: Bath Cleaner No preservative



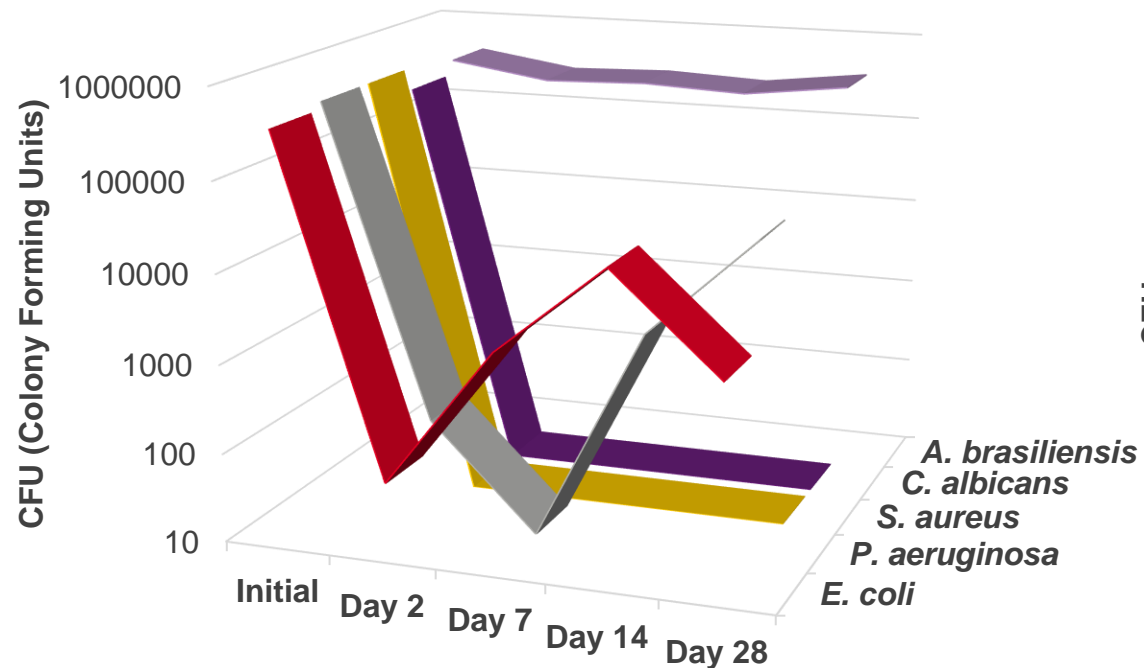
- Bacterial control
- Fungal control

■ *E. coli* ■ *S. aureus* ■ *P. aeruginosa* ■ *C. albicans* ■ *A. brasiliensis*

Commercial solid bath cleaner was diluted per instructions with tap water and underwent PET testing.

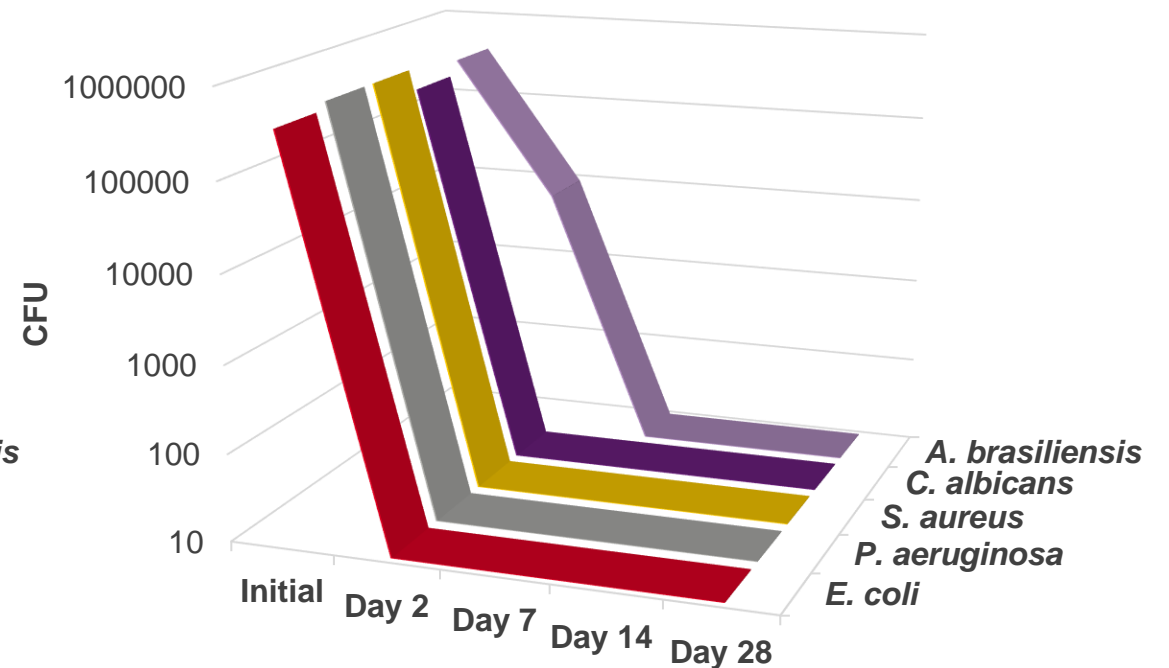
Raw Material Preservation: Sodium Lauryl Ether Sulfate (2 EO) (30% actives)

Negative Control: pH 6



- Bacteria requirements
- Fungi requirements

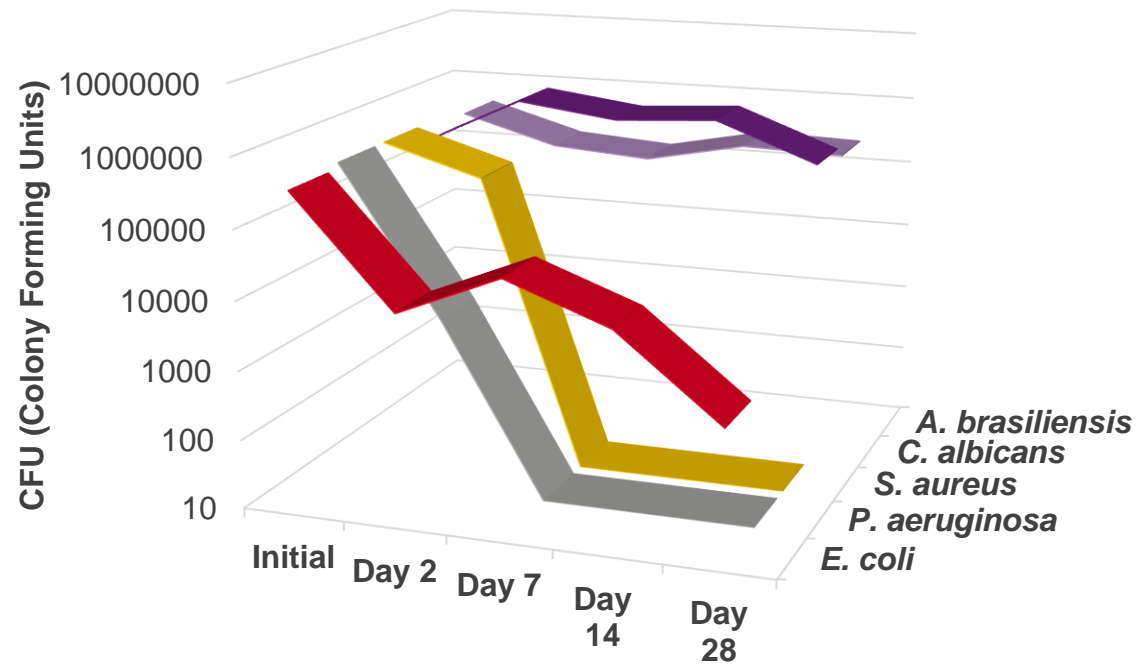
Kalaguard® 0.5%: pH 6



- Bacteria requirements
- Fungi requirements

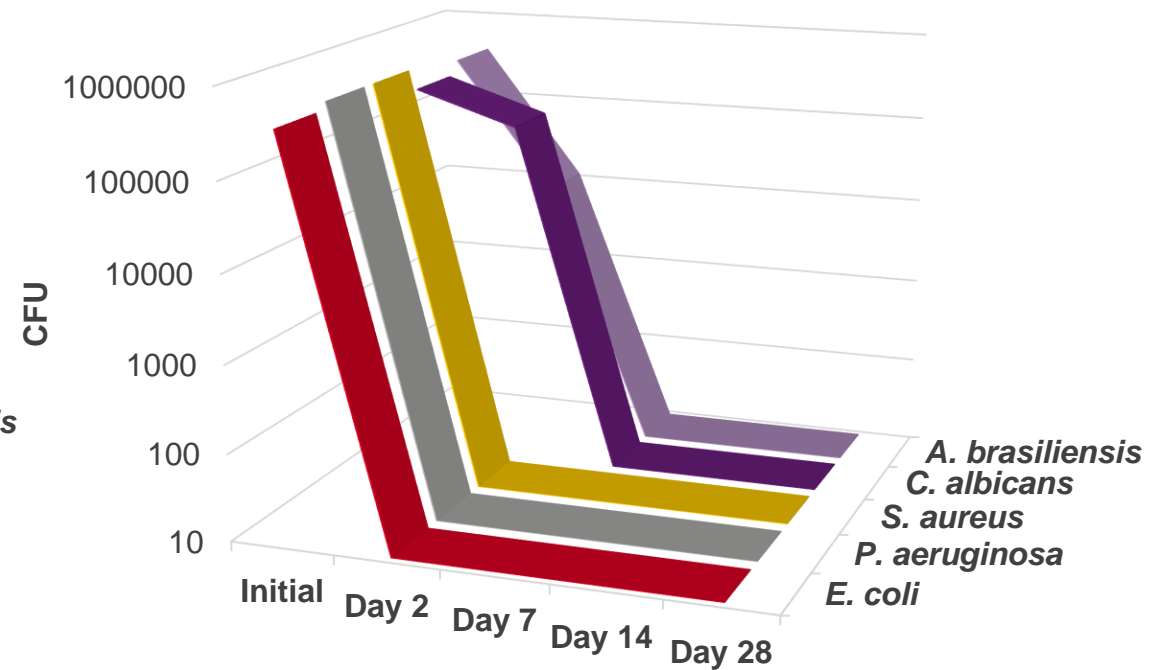
Raw Material Preservation: Polyvinyl alcohol (10% actives)

Negative Control: pH 5.7



- Bacteria requirements
- Fungi requirements

Kalaguard® 0.5%: pH 5



- Bacteria requirements
- Fungi requirements

Home Care Raw Material Market Examples

Fragrance encapsulates

Fragrance formulations for the home care industry

Requirements:

- 100% isothiazolinone-free
- Nature-identical preservative
- Shelf life stability and protection against contamination

Result:

- Kalaguard® SB incorporated as a nature-identical alternative to ITs, achieving effective preservation

Cellulose rheology modifiers

Naturally sourced cellulose rheology modifiers suitable for home care and personal care products

Requirements:

- 100% isothiazolinone-free
- Shelf life stability and protection against contamination

Result:

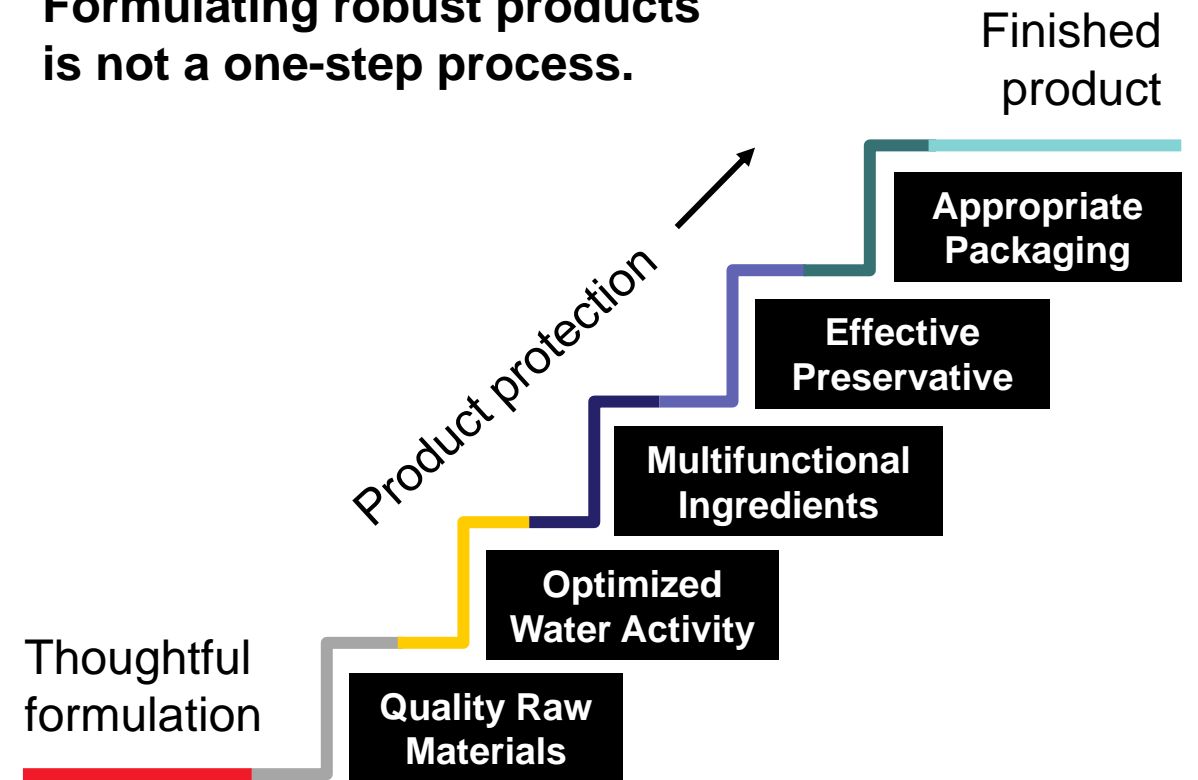
- Kalaguard® SB incorporated as a non-sensitizing alternative to ITs, achieving effective preservation

Kalaguard® SB provided safe preservation to replace isothiazolinones in home care raw materials

Modern Approach to Preservation

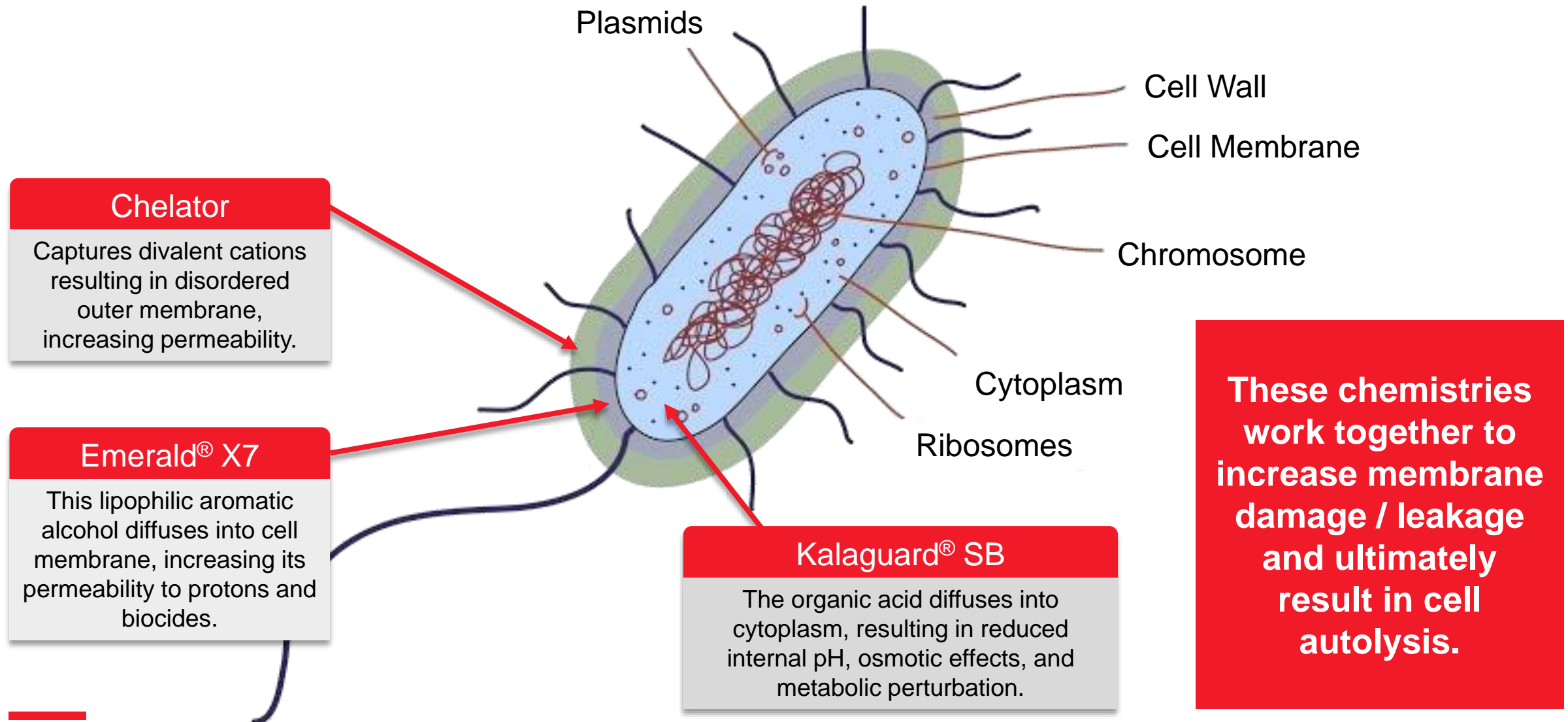
- **Hurdle technologies** — Consider multiple layers of protection against microbial activity.
 - pH
 - Water activity
 - Bioburden of ingredients
 - Packaging
 - Type of product / intended use (e.g. concentrates)
- **Plant hygiene** — Even a miniscule amount of microbes introduced during manufacturing can quickly lead to quality problems.

Formulating robust products is not a one-step process.



Manufacturers must achieve effective preservation, meet consumer needs, and work with a limited toolkit of preservative chemistries. **The full formula must be considered to meet all of these requirements.**

A multi-tiered approach to product protection



Emerald[®] X7 Multifunctional

Multifunctional for home care

- Enhanced soil removal
- Loosens greasy soils for easy rinsing
- Solvent
- Process Aid
- Enhances microbial action of **Kalaguard[®] SB**
- Typical dosage 0.1-0.5 wt.% of total formula

Desirable HS&E Profile

- Readily biodegradable
- Nature identical
- Non-sensitizing, low toxicity
- Listed for use by EPA Safer Choice (●)
- TSCA listed
- REACH registered

Effective over a broad pH range (2 – 10) for aqueous applications and more.

Key Takeaways



Consumers are scrutinizing product labels

- Safety and wellness trends, increased cleaning
- Demand for ingredient transparency and non-irritating ingredients
- Retailer clean-label programs



Sustainability is no longer a niche category

- Eco-related label claims and certifications on the rise
- Evolving requirements for sustainable packaging and ingredients



Effective microbial control is essential

- Protect consumers from potential hazards related to contamination
- Prevent brand damage due to a recall
- Ensure products work as intended throughout their shelf life



Kalaguard® SB expands the preservative palette

- Consumer friendly in-can microbial control
- The only FIFRA / BPR reg. sodium benzoate
- Broadly effective and synergistic with other ingredients & boosters
- Green and non-irritating

Disclaimer



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Thank you

LANXESS Flavors & Fragrances

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kalaguard@emeraldmaterials.com

Learn more:

SOFW October 2021 issue, "Green Raw Material & Product Preservation"

