

Traditional Mold Inhibition Options

- Calcium Propionate
- Sorbic Acid
- Potassium Sorbate
- Fumaric Acid
- Phosphoric Acid



Natural Mold Inhibition Options

- Cultured Ingredient
 - Fermented Wheat
 - Fermented Wheat Starch
 - ► Fermented Whey
 - Fermented Dextrose
 - Fermented Corn
- Vinegar
- Raisin Juice Concentrate

Why Natural Mold Inhibition?

- #1 Consumers
- #2 Use in Organic applications
- #3 Use in Non GMO applications



AlphaFresh

"A superior solution to natural mold inhibition"

- In 2015 Clean Label Food was a 165 billion dollar industry
- In North America alone it was a 62 billion dollar industry



source: Statista

Global Consumers want transparency in Ingredients

- In fact, three-quarters of global respondents (75%) strongly or somewhat agree that they're concerned about the longterm health impact of artificial ingredients
- with the highest level of agreement in Asia-Pacific (80%). In addition, 69% strongly or somewhat agree that foods without artificial ingredients are always more healthful, and just over half (52%) strongly or somewhat agree that foods and beverages with fewer ingredients are t more healthful, with agreement even stronger in North America (61%).

Source: The Nielsen Global Health and Ingredient-Sentiment Survey, Q1 2016



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CLEAN LABEL PRODUCTS ARE WINNING ACROSS THE STORE

Categories seeing the highest dollar growth







SHARE OF CLEAN LABEL SALES BY CATEGORY AND SHIFT

Winning categories compared with 2 years ago



*Conventional Includes Conventional and No Artificials, Clean Includes Clean Label, Simple and Sustainable Source: Nielsen Product Insider, powered by Label Insight, 52 weeks ended July 8, 2017

At The Top of the List...

Artificial flavors (62%), preservatives (62%) and colors (61%) top the list of ingredients that consumers around the world try to avoid

Source: The Nielsen Global Health and Ingredient-Sentiment Survey, Q1 2016





Source: The Nielsen Global Health and Ingredient-Sentiment Survey, Q1 2016

Americans believe 'preservatives / chemicals' are significantly more harmful than added sugar, saturated fat and sodium, says new poll. A poll* of more than 4,200 US consumers conducted in April 2015 by CivicScience shows Americans believe that 'preservatives / chemicals' are significantly more harmful to their health than added sugar, saturated fat and sodium.



Source: Foodnavigator April 2015

Food production, values impact purchases

One third say it is highly important to know that a company shares their values



Q: How important are the following factors in your decision to purchase a food or beverage? (n=1,002)



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2017 FOOD & HEALTH SURVEY

75% of Consumers Will Pay Extra For Clean Label Ingredients

Clean label is the new norm when it come to food and beverage products. This concept is supported by results of a recent survey commissioned by specialty PR agency Ingredient Communications that found as many as 73 percent of consumers are happy to pay a higher retail price for a food or drink product made with ingredients they recognize and trust

Source: Food Products Insider December 2016



7 in 10 Prefer No Artificial Ingredients

That said, only 4 in 10 of those who do prefer the option with no artificial ingredients would pay an additional 50% for it

Preference for Products with No Artificial Ingredients

Imagine you are going to the store to purchase a food or beverage you like. You see they have made a newer version of the product. Option A has all the original ingredients you are familiar with, including artificial ingredients. Option B has similar ingredients, except no artificial ingredients. Which option would you likely purchase?



If Option B is Preferred: If Option A costs \$1.00, what is the most you would be willing to pay for Option B?



Max Price Willing to Pay

Q55: Imagine you are going to the store to purchase a food or beverage you like. You see they have made a newer version of the product. Option A has all the original ingredients you are familiar with, including artificial ingredients. Option B has similar ingredients, except no artificial ingredients. Which option would you likely purchase? (n=1,009) (95: If Option A costs \$1,00, what is the most you would be willing to pay for Option B? (Of those who are likely to purchase? (n=736))

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Top QSR's Eliminating Artificial Preservatives















McDonalds Already Out Front...Announced September 28, 2018

McDonald's removes calcium propionate from buns



Photo: McDonald's Corp.

Grocery chains are eliminating chemical preservatives as well



- Natural Mold Inhibitors are made by Natural fermentation of a carbohydrate stream and an FDA approved Microbe
- Vitamins and Minerals are added for the microbes
- Typical process involves a 5 to 7 day Fermentation Cycle under controlled conditions of Temp and pH, however length can vary
- Some manufacturers then run a process to remove biomass and associated color/flavor
- The ingredient is then dried typically on a spray dryer

Natural Mold Inhibitors What to Look For

- Visual confirmation against a standard
- Bake Test
- ▶ pH
- Total Acids
 - Expect to see mostly propionic acid. Additional acids should also be present including acetic and lactic
- Propionic Acid via HPLC
 - Random samples sent out annually to a 3rd party lab for verification
- Acid Levels will range from low single digit levels to mid 30% levels

Natural Mold Inhibition APPLICATIONS

CAIN FOOD INDUSTRIES 2018



Fermentates and Fermented Wheat

- Yogurt, Sauerkraut, Kimchee
 - Lactic Acid Bacteria
- Swiss Cheese
 - Propionibacterium
- Fermented wheat, whey, dextrose, corn etc.
- Fermentation produces organic acids
 - Lactic, propionic, acetic etc.
- AlphaFresh is produced through natural fermentation which yields an ideal combination of organic acids for mold prevention.



Byproducts of Yeast Fermentation

ACIDS Butyric Succinic Propionic Heptanoic

- Pelargonic
- Pyruvic
- Palmatic

Crotonic

- Itaconic
- Levulinic
- Acetic
- Lactic
- ► Formic
- Valeric
- Caproic

Myrisitc

Lauric

- Hydrocinnamic
- Benzylic
 - ALCOHOLS
- Ethanol

- *n*-Propanol
- Isobutanol
- Amyl alcohol
- Isoamyl alcohol
- 2,3-Butanediol
- B-Phenylethyl alcohol

- **ALDEHYDES**
- Acetaldehyde Formaldehyde
-
- Isovaleraldehyde
- n- Valeraldehyde
- n- Hexaldehyde
- Acetone
- Propionialdehyde
- Isobutyraldehyde
- Methyl ethyl ketone
- 3-Butanone
- Diacetyl
- Acetoin

Carbonyl Compounds

- Furfural
- Methional
- Glyoxal
- 3-Methyl butanol
- 2-Methyl butanol
- Hydroxylmethyl furfural

E.J. Pyler and L.A. Gorton (2008)Compounds Reportedly Produced During Fermentation and/or Baking Baking Science and Technology Fourth Edition. P.296 (TB 2.B.07)



Working Mechanism

- "The inhibiting effect for microbials is probably related to competition with acetate in the acetokinase systems, to blockage of pyruvate conversion to acetyl-coenzyme A and to interference with B-alanine in pantothenic acid syntheses" (Bässler, 1959).
- It disrupts the metabolism of the mold cell.
- It prohibits the mold cell from reproducing.

Bässler, N.H. Z Lebensm Unters Forch (1959) 110: 28. https://doi.org/10.1007/BF01001966



The Krebs Cycle (TCA Cycle)



Figure From: El Bacha, T., Luz, M. & Da Poian, A. (2010) Dynamic Adaptation of Nutrient Utilization in Humans. Nature Education 3(9):8

Intrinsic product properties

- Low to moderate PH yeast leavened products.
- Low to moderate PH chemically leavened products
- TTA
- Water activity
- Moisture

Extrinsic product properties

- Good sanitation practices
- Packaging



Natural Mold Inhibition Targeted Molds

Mold Color Genera Types	
Mold Color	Genera
Black	Rhizopus
Green	Aspergillus, Penicillium
White	Mucor
Orange	Neurospora





E.J. Pyler and L.A. Gorton (2008)Compounds Reportedly Produced During Fermentation and/or Baking Baking Science and Technology Fourth Edition, Vol .1; P.460

Functional With...

- Bread, Buns and Rolls
- High Fiber Products
- English Muffins
- Flour Tortillas and Flatbreads
- Pizzas
- Yeast Raised Doughnuts



- Rich formulas/ Sweet Goods
- Crackers
- Refrigerated product
- Enrobing
- Organic products

Natural Mold Inhibitor Benefits to Expect

- Cleaner Label
- Minimal flavor impact
- Aroma and Color
- Ease of scaling and handling
- Reduction or elimination of additional preservatives
- Minimal processing impact, yeast
- Minimal to no effect on finished product qualities
- Potent at reasonable use levels
 - 0.5-2.0% bakers



Thank you for your time today!



