



YEAST FERMENTATION *AND* FOOD-FORM MINERALS

The Ideal Process for **Nutrient Uptake** and **Bioavailability**

WE ALL REMEMBER the first-grade experiment of the paper cup and a sprouting green seed rising from the black dirt. It's a remarkable process that even in adulthood never fails to inspire. What does the dirt filled paper cup, a seed, a little sunshine and water have to do with life giving, food-form minerals in dietary supplements and food? Everything.

In this white paper, you will learn why a yeast fermentation process is the best and, frankly, the only way to produce food-form minerals – the type that naturally occur in plants. Food-form minerals made with a yeast fermentation process are the most bioavailable form with the most health benefits. And while the term yeast may raise consumer concerns about out-of-control pathogens, globally renowned yeast scientists agree that the type of yeast used to make food-form minerals is safe, non-pathogenic and is completely lifeless before it is put in supplement and food formulations.

TO BETTER UNDERSTAND WHY this yeast process is so important, let's go back to that early lesson in biology. When plants grow, they uptake minerals like selenium, magnesium and zinc from the soil. At this stage, the minerals are in their simplest form called inorganic, which are basically rocks and salt. Plants use inorganic minerals, along with water and sunlight, as energy sources to grow.

We all remember from biology class; it's the process called photosynthesis. By the time those minerals move through the plant, they are synthesized into very important organic forms of nutrients, like the trace mineral selenium. This organic form of selenium is what we get from plants, Brazil nuts and proteins from animals that eat plants. The amount of selenium we consume is directly related to the amount of selenium in our diets.

Selenium is an essential nutrient for humans because it is an integral component of the 25 selenoproteins identified in humans, which have a role in antioxidant defense, redox state regulation, and a variety of specific metabolic pathways. Glutathione peroxidase, in particular, is a key enzyme that plays a critical role in the metabolism of the body's master antioxidant, glutathione. This system cannot function without adequate selenium levels.¹

Most of us take for granted that we get enough minerals like selenium from the foods we eat. But even with the healthiest of diets, soil scientists say that selenium intake through food is predicted to decline because of climate change. A study examining soil conditions and dry weather patterns shows that the world could see a 9% decline in soil selenium by the turn of the century.² And with one billion people

already low in selenium intake, this could lead to significant health problems for humans.

FOOD-FORM SELENIUM TO THE RESCUE

Poor diets and soil degradation means that it's more important than ever to pay closer attention to selenium levels in supplements and foods. Remember that without it, our bodies cannot function properly, which raises the risk for poorly functioning

"A STUDY EXAMINING SOIL CONDITIONS AND DRY WEATHER PATTERNS shows that the world could see a 9% decline in soil selenium by the turn of the century."² Proceedings from the National Academy of Sciences.

BENEFITS OF THE USE OF *SACCHAROMYCES CEREVISIAE* YEAST

For centuries food, beverage and personal care manufacturers have relied on *S. cerevisiae* to enhance the texture, stability and nutrient values of their products. Here are just a few examples.⁴

BREAD: The most common yeast used to make bread is *S. cerevisiae*. The yeast feeds on the sugars in the bread dough, which produces carbon dioxide bubbles, allowing it to rise into an airy loaf.

BEER: If you like ale style beers then you are familiar with *S. cerevisiae*. Although beer making uses several different yeasts, *S. cerevisiae* is the most common. The yeast ferments the sugars in malted barley to produce alcohol.

WINE: Wine makers rely on various yeasts to enhance the fermentation process. The *S. cerevisiae* yeast is commonly used to stabilize this process.

TEQUILA: As tequila ferments, a number of yeasts are naturally present including *S. cerevisiae* among others.

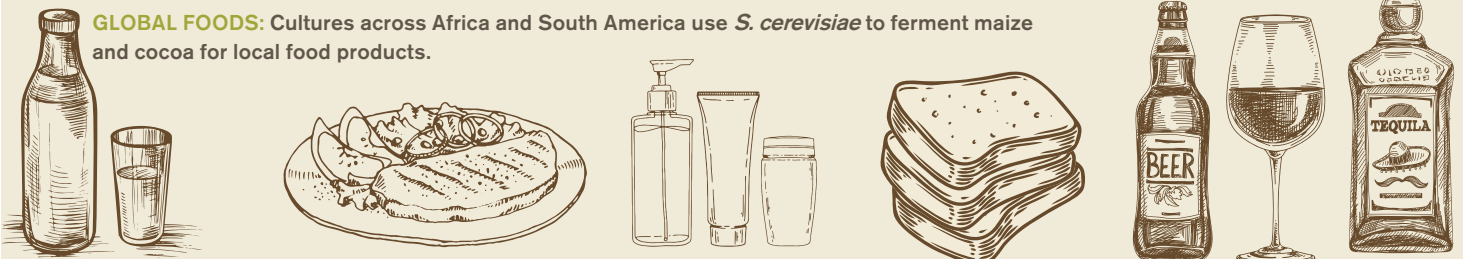
KEFIR: This fermented dairy beverage contains a mixture of lactic acid bacteria and yeast strains, including *S. cerevisiae*.

YEAST EXTRACT: Savory food products like meat extracts, gravy and brown sauces and yeast spreads like Marmite and Vegemite use *S. cerevisiae* as the foundation.

SKIN CARE: Cosmetic and anti-aging skin care products add *S. cerevisiae* yeast as a skin-conditioning agent because of its ability to reduce oxidative stress and improve skin moisture levels.

PROBIOTICS: The biotherapeutic probiotic yeast called *S. cerevisiae* var. *boulardii* has been used for decades to address severe diarrhea and gastrointestinal disorders.

GLOBAL FOODS: Cultures across Africa and South America use *S. cerevisiae* to ferment maize and cocoa for local food products.



SELENIUM THE SUPER HERO

A NUMBER OF SUPPLEMENT and food companies choose to use inorganic, isolates and synthetic forms of selenium even though the science doesn't support these practices. Gold standard, human clinical trials using selenium yeast show that this very inexpensive, organically bound mineral is more bioavailable than other forms of selenium.

LEAVES

3. This process transforms the inorganic minerals into ionic forms, which creates a highly bioavailable nutritious form of organic minerals for humans and animals. When animals and humans consume plants, the body knows exactly how to use the minerals within these plants for vital bodily processes.

STEM

2. The mineral combines with water and both are pushed through the plant's cells in the stems and leaves.

ROOTS

1. Plants absorb inorganic forms of mineral from soil through root hairs. These inorganic minerals are the ideal natural food for plants, but they are not bioavailable to humans in this form.

immune systems as well as greater risks for certain cancers and aged-related diseases.

When formulating with selenium can you use just any form? We think if plants and proteins from plant-eating animals are the gold standard form of selenium, then our supplements and foods contain the same type of selenium. Think about that. If nature gives us a prototype for the best form of selenium, then why shouldn't we honor that process? That is where the yeast process comes into play.

The only (and we mean only) way to create a food-form mineral is with a fermentation process that uses yeast. A form of baker's yeast – just like the type of yeast used in bread and beer making – which mimics the same process as plants. So, as when an inorganic form of selenium is added to our form of yeast (*S. cerevisiae*), fermentation transforms selenium slurry into an organically bound, food form of selenium yeast.

ISN'T ALL THAT YEAST DANGEROUS?

During the production process, the yeast is completely killed. So, while the *S. cerevisiae* yeast recreates the wonder of nature in plant science, it is sterilized before it is used in foods and supplements.

Even so, over the decades there has been a lot of worry about the health dangers of yeast. And while we agree that pathogenic yeasts should be avoided at all cost, yeast fermentation uses a nonpathogenic *S. cerevisiae*. It is rare (if not impossible) for a nonpathogenic yeast to cause infections like the better known pathogenic yeast called *Candida albicans*, which is known to

"THERE IS ABSOLUTELY NO LOGICAL REASON TO LIMIT SACCHAROMYCES CEREVISIAE FROM THE DIET. THERE IS NO CLINICAL SUPPORT AND I STRONGLY CONDEMN THIS PRACTICE," SAYS JACK SOBEL, MD.

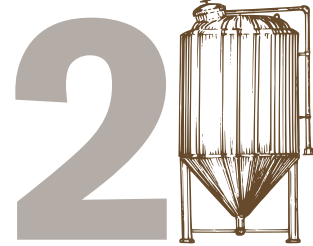
cause yeast infections in women. Yeast medical experts say the only evidence they have seen of any problems with *S. cerevisiae* causing health problems is for individuals undergoing bone marrow transplants with “profoundly compromised immune systems.” In an interview on the subject, Jack D Sobel, MD, the world’s leading yeast expert, said: “The *Saccharomyces* that was associated with disease was not introduced by eating or consumption of it,” he says. “We eat *Saccharomyces cerevisiae* all the time and it does not cause disease.”

Dr. Sobel says that a great deal of confusion has been caused by advice for women with problems related to *Candida* overgrowth to consume a completely yeast free diet including *S. cerevisiae*. “There is absolutely no logical reason to limit *Saccharomyces cerevisiae* from the diet. There is no clinical support and I strongly condemn this practice,” says Sobel. See the *S. cerevisiae* sidebar for other everyday products that use this form of fermentation.

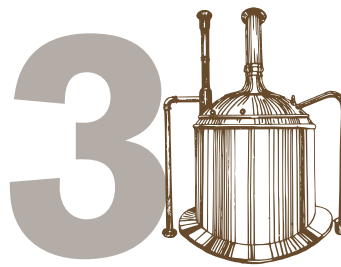
EXAMPLE OF THE PROCESS



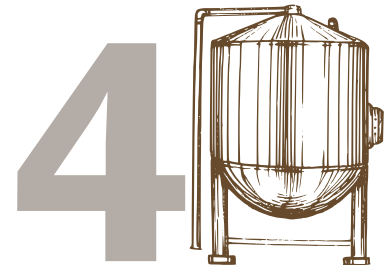
S. cerevisiae starts to grow in the laboratory in the presence of sugar and nutrients.



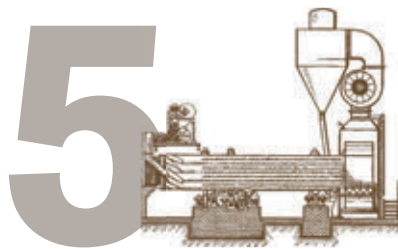
In the next step, the yeast grows in big vessels while sugar, selenium, and nutrients are added.



The selenium yeast cream is separated from the fermentation broth and washed.



The solution is pasteurized to inactivate the yeast.



The inactivated selenium yeast is spray dried according to specifications.



The selenium yeast is sent to customers where it is encapsulated, bottled, or added to food and beverages.

(ENDNOTES)

1. Roman M. et.al. Selenium biochemistry and its role for human health. *Metallomics*, 2013, 6, 25-54.

2. Jones GD, Droz B, Greve P, Gottschalk P, Poffet D, McGrath SP, Seneviratne SI, Smith P, Winkel LH. Selenium deficiency risk predicted to increase under future climate change. *Proc Natl Acad Sci U S A*. 2017 Mar 14;114(11):2848-2853.

3. Interview with Jack Sobel, MD, Nutritional Yeast and Yeastophobia, *Whole Foods Magazine*, July 1999. Accessed March 30, 2017. http://www.drpasswater.com/nutrition_library/Yeastophobia_2_Sobel.html

4. Querol, Amparo, Fleet Graham. *Yeast in Food and Beverages*. Springer Verlag 2006. https://www.researchgate.net/profile/Amparo_Querol/publication/226761626_Molecular_Methods_to_Identify_and_Characterize_Yeasts_in_Foods_and_Beverages/links/0f31753c68b4043cf3000000.pdf

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OUR SCIENCE IS GOLDEN AT CYPRESS INGREDIENTS

AFTER 20 YEARS OF EXPERIENCE, Cypress Systems continues to offer food form minerals and nutritional yeast products that address the growing need for scientifically tested, high quality, GMP compliant nutritonal ingredients.

Cypress Systems is the pioneer in high selenium yeast clinical science and a standardized formulation that is enturstred to the National Cancer Institute.

For the health of your customers, Cypress Systems is here to provide the highest quality minerals available on the market today.

Cypress Systems, makers of SelenoExcell®, Chromium GTF Excell® and a full line of NutraFeast nutritional yeast products.