

The remarkable yeast *Kazachstania humilis* – discoveries with potential in combating bacteria

Yeasts of the species *Kazachstania humilis* are among the most commonly found microorganisms in naturally fermented foods, especially in sourdough bread. Humans have harnessed various yeasts and bacteria for years to produce bread, yogurt, cheese, wine, and pickled vegetables. These microorganisms have beneficial effects on our health. Additionally, many yeast species are known to produce substances called “killer” toxins that inhibit the growth of other yeasts and bacteria. Interestingly, fewer studies focus on their effects on bacteria. Scientists are exploring these interactions to develop novel applications for yeasts and their products in medicine, agriculture, and biotechnology.

The star of our project, *Kazachstania humilis*, is renowned worldwide for its presence in fermented foods. It can be found in sourdough, where it imparts a distinctive taste and aroma, and in fermented agave juice, which is used to produce tequila, the popular Mexican alcoholic beverage. Strains of *Kazachstania humilis* isolated to date are widely utilized in food fermentation processes, but until now, they have not been associated with antibacterial activity.

In our laboratory, we have isolated a strain of *Kazachstania humilis* MAW1, not from sourdough, but from bioreactors processing by-products of the sugar industry into biohydrogen. This strain disrupted biohydrogen production by interfering with bacterial activity. This raised an intriguing question: do other strains of this species, particularly those from fermented foods, exhibit similar properties? This question forms the foundation of our innovative project.

What are we looking for?

Our research project aims to:

1. Examine whether strains of *Kazachstania humilis* associated with the food industry possess antibacterial properties and determine the conditions under which these properties are most prominent.
2. Identify the substances responsible for the antibacterial effects and understand the mechanisms behind their activity.
3. Study a broad spectrum of bacteria to assess the universality of these effects.

We aim to investigate how different *Kazachstania humilis* strains influence the growth and reproduction of pathogenic bacteria, including those harmful to humans and plants.

How will we achieve this?

To meet these goals, we will use state-of-the-art equipment and techniques, including fluorescent and confocal microscopy, mass spectrometry, gas and liquid chromatography, and molecular-level analyses.

Why is this important?

Kazachstania humilis, known until now primarily for its role in food fermentation, could become a new weapon in the fight against bacteria. Confirming the antibacterial properties of these yeasts could revolutionize multiple fields. As safe and environmentally friendly agents, they could replace toxic chemicals in medicine and agriculture, serving as alternatives to antibiotics and pesticides. Additionally, they could enhance fermentation processes in the food and biotechnology industries.

Research on *Kazachstania humilis* demonstrates how fundamental science can lead to practical and innovative solutions for contemporary challenges.