Saccharomyces cerevisiae: Multifaceted Applications in One Health and the Achievement of Sustainable Development Goals

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Saccharomyces cerevisiae (SC), a yeast with an extensive history in food and beverage fermentations, is increasingly acknowledged for its multifaceted application in promoting and benefiting all aspects of a 'One Health' approach, including the prevention and control of zoonoses. For instance, SC contributes to environmentally sustainable agricultural practices through the reduced use of toxic agents, thus minimizing air and soil pollution while enhancing crop quality. Additionally, this versatile yeast can improve the health of domestic and farm animals, leading to more efficient and sustainable food production, while fostering synergistic impacts across environmental, animal, and human health spheres. Moreover, SC directly applies benefits to human health by promoting improved nutrition, improving gut health through probiotics, as an alternative to antibiotics, and treating gastric disorders. By aligning with several Sustainable Development Goals (SDGs), SC is vital in advancing global health and well-being, environmental sustainability, and responsible consumption and production. This entry illustrates the numerous benefits of SC and highlights its significant impact on a global 'One Health' scale, promoting the achievement of SDGs through its unique characteristics and deeper understanding of its contribution to the One Health concept.

Keywords: Saccharomyces cerevisiae ; brewer yeast ; baker yeast ; One Health ; Sustainable Development Goal ; agricultural practices ; probiotics ; antibiotic alternatives ; gastric disorder treatments

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The concept of One Health emerged in the early 2000s in response to the spread of pathogenic avian influenza H5N1, which threatened human and animal health, the food industry, and the global economy [1]. One Health recognizes the interdependence of human, animal, and environmental health. As the human population expands, our interactions with both domestic and livestock animals, as well as with the environment, are becoming increasingly frequent. This growing closeness is accompanied by intensified human activities, such as large-scale farming and agriculture, which can damage the environment and increase the risk of zoonoses and favor emergence of new diseases.

The One Health approach is a collaborative, multisectoral, and transdisciplinary effort to address health challenges at the intersection of environmental, animal, and human health. One Health emphasizes the interconnected nature of well-being across domains and focuses on disease prevention and surveillance. This approach encourages cooperation among professionals from various disciplines, such as public health, environmental science, and related fields. By promoting innovative solutions that consider the complex relationships between these domains, One Health contributes to a healthier and more sustainable future. This concept aligns with the principles of the Sustainable Development Goals (SDGs) established in 2015 by the United Nations. Both frameworks address global challenges holistically and interconnectedly, covering various social, economic, and environmental issues [2]. Several SDGs are closely linked to the One Health approach, such as good health and well-being (SDG 3), clean water and sanitation (SDG 6), sustainable cities and communities (SDG 11), climate action (SDG 13), and life on land (SDG 15).

Saccharomyces cerevisiae (SC), commonly known as baker's or brewer's yeast, is a versatile microorganism used for centuries in food and beverage production. Beyond its traditional uses, it has diverse applications in biotechnology, biofuel production, and bioremediation. With a flexible genome spanning 12 megabases and containing around 6000 genes, SC is well-suited for various research and technological applications. Its short doubling time of approximately 90 min. and ability to grow in both aerobic and anaerobic conditions further enhance its usefulness [3]. One particularly well-studied strain is *S. cerevisiae var. boulardii* (SCb), which exhibits a trisomy chromosome IX, contributing to its enhanced growth rate and ability to thrive in acidic environments [4][5]. Today, SCb is mainly used as a dietary supplement for healthy individuals and is the most prominent probiotic yeast. Various extracts, such as inactivated dried form, yeast cell wall, yeast extracts, and yeast fermentation byproducts, are used in many fields. These extracts find applications in the food supplement and cosmetic industries (due to their high amino acid or protein content) and in the food and drug industries

(for antioxidants such as glutathione peptide, minerals, and vitamins). Probiotics are defined by the Food and Agriculture Organization (FAO) and World Health Organization (WHO) as “live microorganisms which when administered in adequate amounts confer a health benefit on the host” [6]. Probiotic and supplement consumption has risen in recent decades, and sales are estimated to reach USD 69.3 billion by 2023 [7]. Today, yeast-based probiotics have expanded beyond food supplements and are also used in the food industry to improve soil and crop quality [8].

This entry explores the diverse roles of SC in promoting the One Health approach and advancing the SDGs. As a key player in numerous aspects of human and animal health and food and environmental quality, SC impacts One Health globally. The following sections highlight the various ways SC improves human, animal, and environmental health and supports the achievement of the SDGs.

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