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The Benefits, Strategy, and Challenges of Using Genetic Engineering for Product Development

Introduction

Genetically engineered microbes (GEMs) are an alternative to traditional probiotics in an industry that currently faces challenges like differentiation, unique benefits, and lack of consistent effects. Harnessing scientific innovation, we can build probiotic strains that are optimized for benefits and safe for human consumption. At ZBiotics we explore how genetic engineering enables the development of products with targeted benefits for consumers, making the probiotics that people want. We have pioneered this space by introducing the market's first genetically engineered probiotic, designed to break down acetaldehyde – a harmful byproduct of alcohol metabolism – in the gut.

Methods

Our probiotic was engineered to express acetaldehyde dehydrogenase, the enzyme responsible for breaking down acetaldehyde into acetate. After ingestion, ethanol is quickly absorbed into the bloodstream from the stomach and small intestines. Absorbed ethanol is transported to the liver where it is first metabolized into the toxic byproduct acetaldehyde by alcohol dehydrogenase (ADH) and subsequently into acetate by acetaldehyde dehydrogenase (ALDH). ADH is present in the gastrointestinal tract (GIT) and a small percentage of ethanol is oxidized into acetaldehyde before absorption. However, the GIT and microbiome of the gut do not produce as much ALDH to catalyze the reaction from acetaldehyde to acetate. As a result, acetaldehyde forms and accumulates in higher concentrations in the GIT than in the liver or bloodstream. Acetaldehyde is also an extremely soluble molecule that can diffuse into the body, easily passing through GIT membranes and into your brain, muscles, and cells. Therefore, an engineered probiotic designed to catalyze the breakdown of acetaldehyde in the gut can have a downstream benefit to seemingly non-gut related effects.

Results

With the release of our pre-alcohol probiotic, ZBiotics is challenging the perception that people are inherently or uniformly opposed to genetically modified organisms (GMOs), regardless of application. With over 4 million bottles sold under the "proudly GMO" label, it is evident that engineered probiotics are acceptable to consumers, if messaged transparently and aligned with consumer values. However, the journey of engineering probiotics presents unique challenges, including consumer education, regulatory landscapes, and manufacturing complexities. We posit that these challenges are justified by the promise of higher efficacy, distinctive benefits, and totally differentiated and patentable products.

Discussion

The presentation outlines the strategic insights gained, the market acceptance, and the operational hurdles we've overcome. We argue that genetic engineering holds the key to disrupting the probiotic industry and charting a new course towards innovative, efficacious, and consumer-driven probiotic solutions. The future we envision for the industry is one where genetically engineered probiotics are a mainstay in fostering wellness and human health. GEMs will redefine the landscape of probiotic products and set new standards for the industry.