A Microbiome Approach to Treat Galactosemia, a Life-Threatening Disorder

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Galactosemia is a life-threatening genetic disease in which patients cannot metabolize galactose, a sugar found abundantly in milk, fruits, and vegetables. As a result, galactose builds up to toxic levels in the blood and organs causing serious damage. No drugs have been developed. Galactosemia is currently managed by a restrictive low-galactose diet which is not sustainable overtime. Therefore, there is a need for a long-term cost-effective solution. The aim was to develop a yeast strain able to detoxify galactose in the gut before its absorption in blood. Multiple yeast strains were evaluated for their unique galactose degradation capability even in presence of other sugars by measuring their growth kinetics on galactose and the remaining galactose concentration in spent medium using an enzymatic test. The performance of the lead candidate (Y10) was further improved by adaptive evolution. Its stability/survival rate in gut environment was investigated by exposure to simulated gastro-intestinal conditions. Furthermore, Y10 ability to establish itself in the gut was evaluated by measuring its adherence to intestinal cells. I successfully developed yeast strain Y10 by adaptive evolution which survived gastrointestinal conditions, adhered to intestinal cells, and degraded galactose in milk by 10-fold, the food with the highest galactose concentration (2.5g/100 mL). A dose of 10e9 cells was estimated to be sufficient to deliver viable yeast cells to where it needs to be most active in the gut. Yeast Y10 could potentially help galactosemia patients by allowing the ingestion of a more normal diet.

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