

Abstract submission

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Title: Urban Resource Valorization: Sustainable Feedstock for Precision Fermentation

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Precision fermentation (PF) capitalizes on genetically engineered microbes as “cell factories” to sustainably produce high-value functional ingredients such as animal-free dairy proteins, heme, and specialty vitamins. Scaling PF bioprocesses to meet growing demand requires substantial volumes of feedstock. Microbial nutrient requirements typically include carbon, nitrogen, and micronutrients such as phosphates. Currently, food crop–derived sugars like dextrose remain the primary carbon source, while animal-origin peptones and yeast extracts supply nitrogen, and phosphate is obtained from mined ores. Redirecting these resources toward water- and energy-intensive PF processes creates competition with human consumption, emphasizing the need for alternative feedstocks. Agricultural and forestry residues are often proposed as substitutes; however, urban systems such as Singapore lack access to such natural resources and importing them from neighboring countries would be logistically inefficient and environmentally costly due to added CO₂ emissions. Using Singapore as a case study, our work investigates the valorization of locally generated industrial sidestreams as sustainable second-generation feedstocks for PF. Demonstrating their capacity to support microbial growth highlights both the feasibility of circular bioeconomy strategies and the economic opportunities in recycling urban industrial by-products.