

# Fungi convert waste starch into value

Researchers at the University of South Australia are turning starchy wastewater from a potato chip factory into the high demand food additive, lactic acid, using a single stage process.

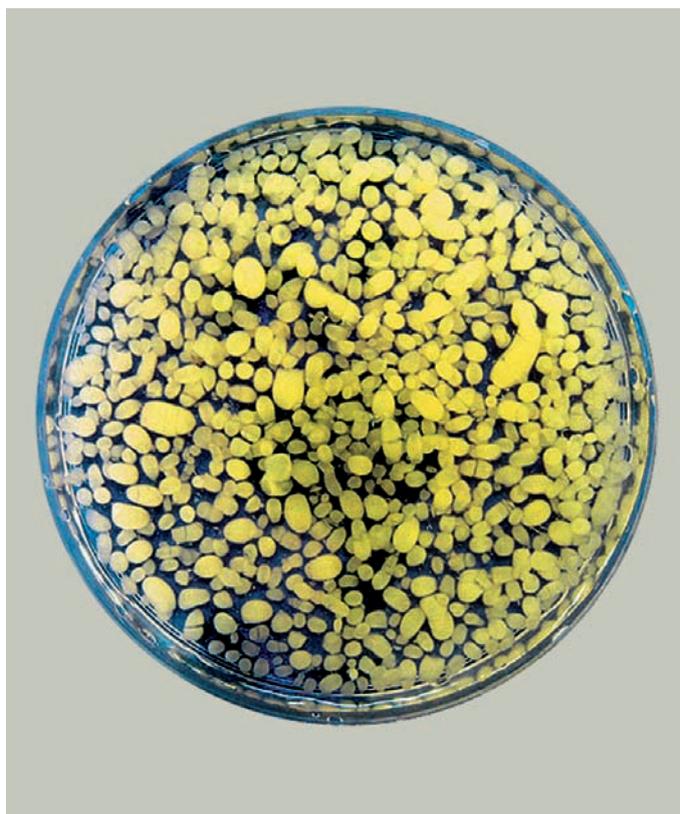
Lactic acid is a highly valuable product that has enormous applications in food and food-related industries in being commonly used to improve the taste of food and pharmaceutical products. It also has applications as a souring agent, disinfectant and neutraliser to adjust pH levels.

The starch wastewater contains much higher concentrations of suspended organic pollutants and has higher chemical oxygen demand (COD) than domestic wastewater. COD is important for assessing and measuring total organic pollutants including nitrogen, which is used to determine the nutrient levels in the wastewater.

Researchers from UniSA's Water Environment Biotechnology Laboratory (WEBL) have developed a process using a fungal strain that converts about 90 per cent of the waste starch directly to lactic acid while at the same time removing all of the suspended solids, one of the key parameters for wastewater quality.

'This leaves clean recycled water that is suitable for irrigation purposes and a fungal biomass containing about 40 per cent protein and nutrients that can be used for fish and animal feed, and even for humans. None of the waste ends up as landfill,' WEBL Director, Associate Professor Bo Jin said.

Both bacterial and fungal strains can be used for lactic acid production. Because fungal strains normally grow very slowly, the fast-growing



The process to derive lactic acid from starch waste leaves white fungal biomass as a by-product. It can be used as protein-rich animal feed. University of South Australia

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bacterial strains are mostly used in industry. However, there are a number of disadvantages in using bacteria for lactic acid production.

When bacteria strains are used in lactic acid production, raw materials such as corn-starch or sugar have to be hydrolysed in a chemical or biological process, and pH levels have to be raised to the acidic range with the use of

chemicals. Therefore lactic acid production needs to be carried out in two stages. In the first stage one bacterium is used to break down starch into sugar, and in the second stage another bacterium transfers the sugar to lactate salts, which then have to be converted to lactic acid.

'The fungal strain that we have isolated and selected converts the starch waste to lactic acid in a simultaneous

saccharification and fermentation process at temperatures similar to normal summers and at a pH of 5, which is very close to the pH of the starch wastewater. We've also been able to improve the productivity rate,' Associate Professor Jin said.

'These conditions make processing very cost effective because we don't have to pay for the waste starch, we can convert the waste to lactic acid without adding sugar because our fungal strain can use nitrogen and other nutrients from within the waste to activate the fermentation process, few chemicals are needed to correct the pH and little heating is required to adjust the temperature.'

Associate Professor Jin estimates that producing lactic acid using the fungal strain will save at least 50 per cent on the current two-stage processing costs.

'The environmental benefits of turning organic waste that would normally end up as landfill into valuable resources, with clean water for recycling as a bonus, are huge,' Associate Professor Jin said.

'UniSA's wastewater treatment and production process will deliver real benefits to the environment, the economy and the food industry.'

The research is being funded by an Australian Research Council Discovery Grant with industry partner Smith's Snackfood Company Ltd.

● **Geraldine Hinder**

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