4th GSC Encouragement Award

"The production processes of organic acids by fermentation without pH neutralization waste using the acid-tolerant fission yeast"

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Five hundred thousand MT of Lactic acid (LA) are produced annually worldwide, and 150,000 MT of them are used for poly lactic acid (PLA).
The PLA market will seem to increase because of its bio-degradable and biomass-derived properties.

LA is mainly produced by fermentation of Lactobacillus. The fermentation is usually neutralized by economical $CaCO_3$ and derived calcium lactate.
Sulfuric acid is added to calcium lactate and obtain LA and gypsum (calcium sulfate) as well. This undesirable gypsum is generated 480,000 MT during produce of 500,000 MT of lactic acid.

Lactate dehydrogenase (LDH) gene was inserted into the chromosome to produce LA from pyruvic acid. Additionally, we deleted pdc2 gene to reduce undesirable ethanol production.

Although it is reported that PDC2 is essential and undeletable, we succeeded in deleting the PDC2 gene using previously developed novel gene deletion method, "Latour method".

We used this newly modified strain for LA fermentation. Starting from 12% glucose solution,
the pH of the solution going down to 2.3 due to LA generation and the production rate of LA was as high as 14.3g/L/h.
Furthermore, we tried Fill & Draw scheme aiming for real production process. We used hollow fiber to separate the yeast from the culture broth and the yeast was re-used for the fermentation.

AGC has already licensed the LA producing yeast suitable for neutralization free process. Additionally,
we are continuously developing other organic acid producing yeast, such as malic acid or propionic acid derivative. We believe our technology will contribute to sustainable and low-carbon society.

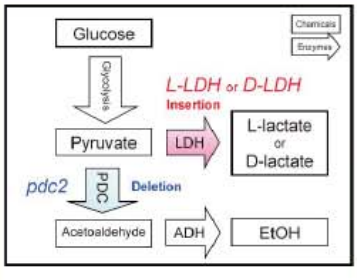

Fig.1. Metabolic modification for LA producing yeast

We succeeded in 24 times repeated fermentation.
The medium was changed into new one, after complete glucose consumption.

Fig. 2. High durability of the new yeast, over 200hrs