

# Development of a purification process for cost-reduced production of postbiotic with a hypoglycemic effect

1. **Developing Staff Members** : Development of a purification process for cost-reduced production of postbiotic with a hypoglycemic effect

## 2. Developing Staff Members

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## 3. Development Idea

The exopolysaccharides( EPSs )extracted from amy-1, which is one strain of *Bacillus amyloliquefaciens*, by our team has been proved to have hypoglycemic effect in previous studies, and it has also been found to have anti-inflammatory and immunomodulatory functions. Although the bacteria has been announced as a probiotic, due to concerns about direct consumption of the bacteria, the extraction of the EPSs secreted by the bacteria can be considered as

another option. Previously, we used the concept that carbohydrate molecules are insoluble in ethanol, adding ethanol to the medium that had cultured amy-1 to precipitate EPSs, but the purity of the extracted products is inconsistent, which not only affects the subsequent research results, but also is not conducive to its patented or commercialized. Therefore, in this project, we attempt to add a step of separating and purifying the crude extract of EPSs in a gel filtration column under fast protein liquid chromatography( FPLC )during the extraction process, so that the purity of the EPSs product could be improved and consistent. Moreover, since a large amount of ethanol is used in the extraction process, in addition to the cost, the generated waste liquid is also likely to pollute the environment. Therefore, we also plan to use the vacuum concentrator to distill and recover the ethanol-containing waste produced in the extraction process. The recovered ethanol can be used to produce EPSs specifically, which reduces not only costs but also ethanol-containing waste production.

## 4. Technological Competition and Industrial Application

According to the International Diabetes Federation (IDF), about 537 million people worldwide suffered from diabetes in 2021, and there were about 2 million people with diabetes in Taiwan, and the number is increasing at a rate of about 25,000 every year. Treatment and blood sugar control receive considerable attention. Therefore, the potential of blood sugar control drugs or foods in the market can also be expected. The amy-1 EPSs extracted by our research team has been proved to have hypoglycemic effect. In addition, research on anti-inflammatory, immune regulation and other effects and related mechanisms has also been investigated. Therefore, if the technology can be developed to improve product purity and mass production, in addition to research and development results can be published in international academic journal, it also can be transferred to the industry and developed towards healthy food or food additives.

## 5. Merchandise Statement of Achievement

According to the technology mentioned above, the crude extract of amy-1 EPSs was purified by FPLC to obtain the carbohydrate-rich product after ethanol precipitation. The purity of the product determined by the phenol-sulfuric acid method was about 97.5%, while the purity of the EPSs crude

extract that had not been purified by FPLC was almost between 80-90% and revealed inconsistent. It can be seen that after this purification step is introduced, the purity of the EPS product can be significantly improved.



Fig 1 : The growing morphology of *Bacillus amyloliquefaciens* amy-1 cultured on solid cultured plate.

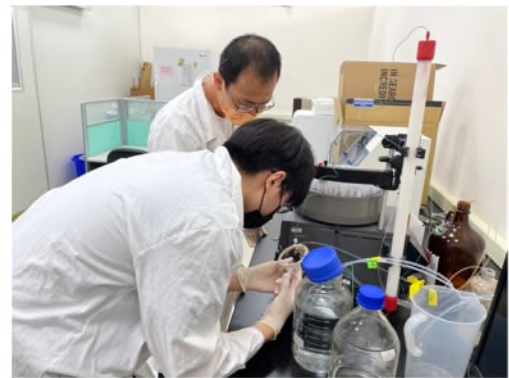


Fig 2 : Injection of EPSs crude extract into FPLC.

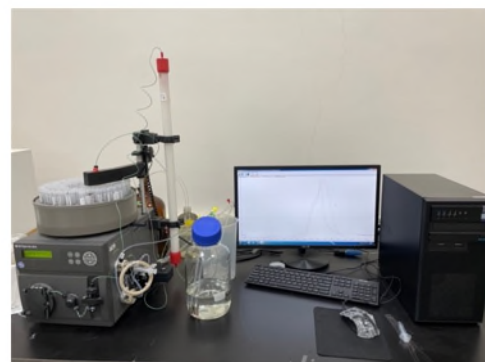


Fig 3 : The operation status of FPLC.