# New presumptive probiotic strains for management of Type-1 Diabetes

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## Introduction

The last decades, the incidence of Type-1 Diabetes (T1D) has dramatically increased in the developed countries. Beyond the genetic impact, environmental factors, including diet, seem to play an important role in the onset and the development of the disease. The intestinal microbiome might affect the interaction between the gastro-intestinal tract and the immune system and result in altered immune responses, affecting the development of T1D. Thus, the restoration of the normal microbiota composition, which could be accomplished with a probiotic-rich diet, constitutes a new target for the prevention and management of the disease. According to the latest definition of FAO/WHO, probiotics are viable microorganisms, which, when administered in adequate amounts, confer a health benefit on the host. Since probiotic properties are strain-specific, *in vitro* testing for maintaining gut homeostasis and antidiabetic capability to alleviate T1D symptoms was of interest in the present study. In this vein, a number of *Lacticaseibacillus rhamnosus* (previously classified as *Lactobacillus rhamnosus*) strains, isolated from traditional fermented Greek products, were screened for potential antibacterial activity against common food-borne pathogens and a-glucosidase inhibitory activity and compared to other *Lactobacillus* species.

## Methods

- A total of 20 wild type lactic acid bacteria strains were isolated from traditional fermented Greek products and identified using 16S rRNA sequence analysis and species-specific multiplex PCR assay.
- The new LAB strains were screened for potential antibacterial action against common food-borne pathogens and a-glucosidase inhibitory activity (Hor et al. 2014; Chen et al. 2014).

## Results

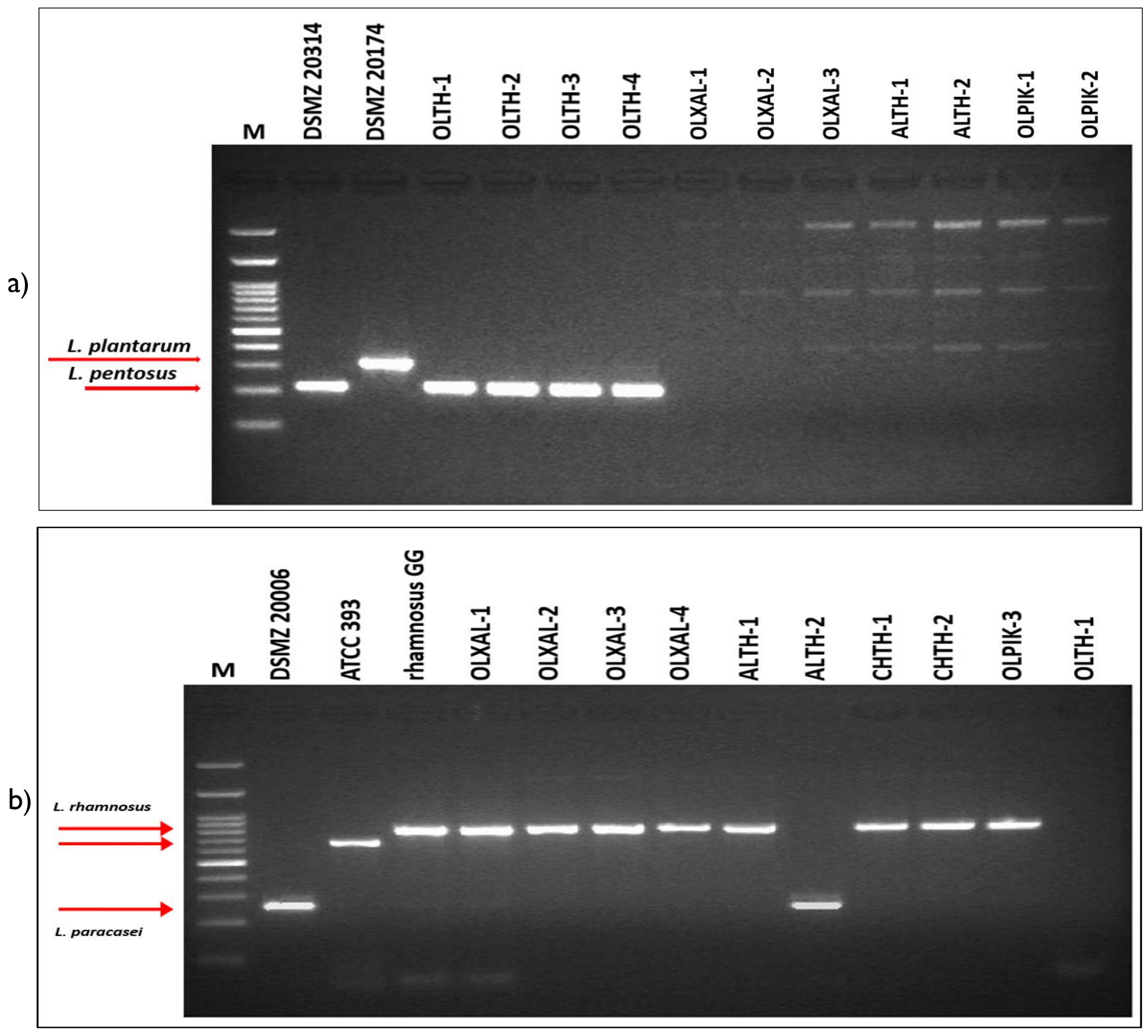


**Figure 1.** Multiplex PCR amplification products obtained from species specific a) *recA*-targeting primers, and b) *mutL*-targeting primers assay.

**Table 1.** Identification of wild type *Lactobacillus* strains isolated from traditional fermented Greek products.

| Strain code | Source | Bacterial species | Strain code | Source | Bacterial species |
|---|---|---|---|---|---|
| OLXAL-1 | Olive (fruit) | *Lacticaseibacillus rhamnosus* | CHTH-3 | Feta-type cheese | *Lacticaseibacillus rhamnosus* |
| OLXAL-2 | Olive (fruit) | *Lacticaseibacillus rhamnosus* | CHTH-4 | Feta-type cheese | *Lacticaseibacillus rhamnosus* |
| OLXAL-3 | Olive (fruit) | *Lacticaseibacillus rhamnosus* | OLTH-1 | Olive (fruit) | *Lacticaseibacillus pentosus* |
| OLXAL-4 | Olive (fruit) | *Lacticaseibacillus rhamnosus* | OLTH-2 | Olive (fruit) | *Lacticaseibacillus pentosus* |
| ALTH-1 | Olive (brine) | *Lacticaseibacillus rhamnosus* | OLTH-3 | Olive (fruit) | *Lacticaseibacillus pentosus* |
| ALTH-2 | Olive (brine) | *Lacticaseibacillus paracasei* | OLTH-4 | Olive (fruit) | *Lacticaseibacillus pentosus* |
| ALTH-3 | Olive (brine) | *Lacticaseibacillus rhamnosus* | OLPIK-1 | Olive (fruit) | *Leuconostoc mesenteroides* |
| ALTH-4 | Olive (brine) | *Lacticaseibacillus rhamnosus* | OLPIK-2 | Olive (fruit) | *Lacticaseibacillus rhamnosus* |
| CHTH-1 | Feta-type cheese | *Lacticaseibacillus rhamnosus* | OLPIK-3 | Olive (fruit) | *Lacticaseibacillus rhamnosus* |
| CHTH-2 | Feta-type cheese | *Lacticaseibacillus rhamnosus* | OLPIK-4 | Olive (fruit) | *Lacticaseibacillus rhamnosus* |

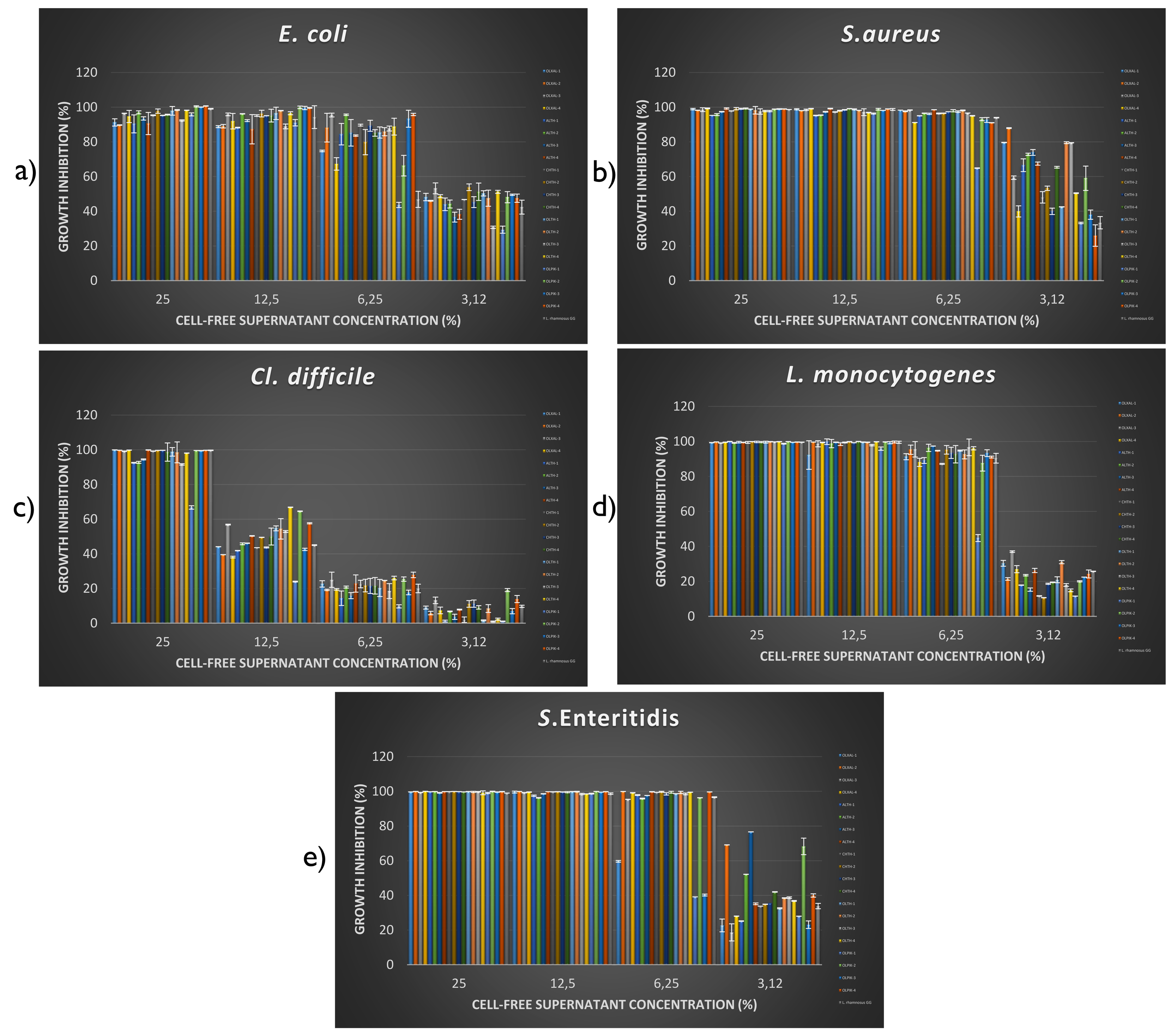


**Figure 2.** Effect of cell free supernatants on the growth inhibition of a) *E. coli*, b) *S. aureus*, c) *C. difficile*, d) *L. monocytogenes*, and e) *S.* Enteritidis. The results are expressed as % percentage of growth inhibition.

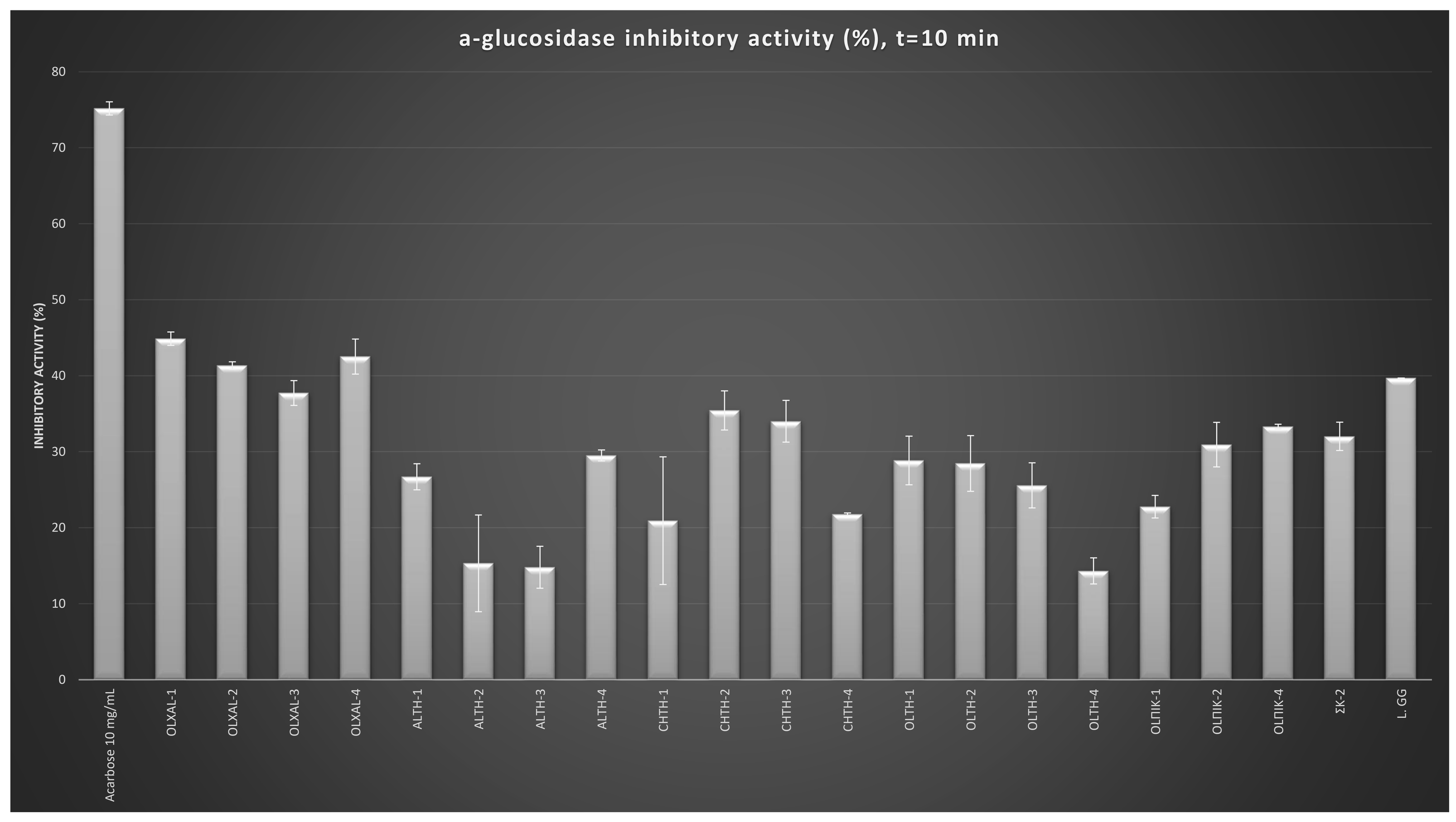


**Figure 3.** *Saccharomyces cerevisiae* a-glucosidase inhibitory activity (%) of LAB cell-free supernatants.

## Conclusions

- Cell-free supernatants exhibited strong antimicrobial activity at high concentrations (25% and12,5%).
- Reduction in growth inhibition activity was recorded at low cell free supernatants concentrations (6,25% and 3,12%).
- *Saccharomyces cerevisiae* a-glucosidase inhibitory activity ranged between 14.81% and 44.87%.
- *Lacticaseibacillus rhamnosus* OLXAL-1 exhibited the highest a-glucosidase inhibitory activity.
- The results suggested that the use of the new isolated strains for modulation of gut microbiota and as antidiabetic agents for the management of T1D should be further explored.

## References

Chen, P., Zhang, Q., Dang, H., Liu, X., Tian, F., Zhao, J., Chen, Y., Zhang, H., Chen, W. (2014). Screening for potential new probiotic based on probiotic properties and α-glucosidase inhibitory activity. Food Control, 35(1), 65-72.

Hor, Y. Y., Liong, M. T. (2014). Use of extracellular extracts of lactic acid bacteria and bifidobacteria for the inhibition of dermatological pathogen *Staphylococcus aureus*. Dermatologica Sinica, 32(3), 141-147.

## Acknowledgment

The research work was supported by the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the “First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant” (Project number: HFRI-FM17-2496, acronym: iFUNcultures).