**The Ability Of *Ideonella sakaiensis* PETase (*Is*PETase) and *Ideonella sakaiensis* MHETase (*Is*MHETase) To Decompose PET Plastic**

**Huy Bui-Quoc1**, Duyen Dinh-Nguyen-Thuy1, Huy Nguyen-Thanh1, Thai Nguyen-Minh1

Department of Microbiology and Parisitology, Faculty of Pharmacy, University of Medicine and Pharmacy at Ho Chi Minh City1, Ho Chi Minh City, Vietnam.

**Background and aims.** Polyethylene terephthalate (PET) is one of the most widely used thermoplastics. However, its accumulation in the environment has caused negative impacts on the ecosystem and human health. Therefore, it is essential to develope effective methods to process PET waste. In recent years,  *Ideonella sakaiensis*  PETase (*Is*PETase) and *Ideonella sakaiensis* MHETase (*Is*MHETase) has attracted attention due to its ability to break down PET. This study focuses on evaluating the degradation potential of these two key enzymes to explore a new environmentally friendly biotechnology for PET waste treatment.

**Methods.** This experiment was conducted on 5x5 mm PET films using enzymes *Is*PETase and *IsMHETase*, which were expressed by recombinant *E. coli* BL21 bearing the genes encoding these two enzymes. A control experiment was performed in parallel by replacing the enzyme solution with distilled water. Surface morphology changes of the PET samples were observed using scanning electron microscopy (SEM) to assess degradation.

**Results.** Transformation results in 5 x 106 transformants/µg. The surface of the PET film samples was partially degraded, forming distinct rough areas as observed under SEM imaging. In contrast, the control sample treated with distilled water retained a smooth surface with no signs of degradation, confirming that the surface alteration was due to enzymatic hydrolysis, which breaks down PET.

**Conclusion.** The results of this study have demonstrated the plastic-degrading potential of the two enzymes *Is*PETase and *Is*MHETase, thereby opening a new avenue for research in the development of plastic waste treatment technologies. This research aims to take the first step toward developing a production process for plastic-degrading enzymes, offering a safer and more effective solution for the treatment of PET plastic waste.

**Acknowledgements.** This research was funded by the University of Medicine and Pharmacy at Ho Chi Minh City, dated 29/04/2025, to Le Thi Thanh Thao.

**References**

(1) Sevilla, M. E., Garcia, M. D., Perez-Castillo, Y., Armijos-Jaramillo, V., Casado, S., Vizuete, K., Debut, A., & Cerda-Mejía, L. (2023). Degradation of PET Bottles by an Engineered *Ideonella sakaiensis* PETase. *Polymers*, *15*(7), 1779. https://doi.org/10.3390/polym15071779

(2) Yoshida, S., Hiraga, K., Takehana, T., Taniguchi, I., Yamaji, H., Maeda, Y., ... & Oda, K. (2016). A bacterium that degrades and assimilates poly (ethylene terephthalate). *Science*, *351*(6278), 1196-1199.