

分子生物學於開發氨氮廢水處理技術和長效生物性抗菌醫材
Molecular Biology for Developing New Technology for Ammonia-Containing
Wastewater Treatment and Long-Term Antibacterial Biomaterials

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The development of Molecular Biology has enhanced the understanding of complicated systems which containing living organisms or bio-active agents in details. Considering the shortage of resource and the threat of pathogens, it is necessary to study the related problem by the approach of Molecular Biotechnology. In this talk, a novel biological wastewater treatment system and non-antibiotic antibacterial biomaterials will be introduced.

Anaerobic ammonium oxidation (Anammox) converts nitrite (NO_2^-) and ammonium (NH_4^+) into nitrogen gas with lower energy cost, less land usage, and almost no N_2O emission comparing to traditional treatment. Anammox can be applied to not only high ammonium strength wastewaters, but also wastewaters from semiconductor industry. Due to the long doubling time and coexistence of nitrogen cycle bacterial community, fine and well controlled of Anammox bioreactor is urgent. We designed specific primers for targeting Anammox family and monitored by quantitative polymerase chain reaction (QPCR). Results of metagenomics showed that the Anammox species identified in this bioreactor may be a new strain which origin from Taiwan. A new bioreactor integrated with real-time monitoring is developed, and the total performance of Anammox system is enhanced more than 10%.

On the other hand, Antibiotics are regarded as the main treatment for bacterial infectious diseases. However, the birth of multi drug resistant super bug has become a serious problem. Antimicrobial peptides (AMPs) can interact with negatively charged bacterial membrane or cell wall through its net positive charge and high proportion of hydrophobic amino acids, causing membrane destruction and killing bacteria. Polyetheretherketone (PEEK) is a kind of thermoplastic material which is often used in orthopedic transplantation surgery. Due to the infection often occurs during orthopedic surgery, we studied the combination of AMPs and PEEK to obtain an orthopedic graft with good antibacterial activity. We test the antibacterial activity of various AMPs against *Staphylococcus sp.* (gram positive bacteria) and *Escherichia coli* (gram negative bacteria), results showed that D-GL13K, L-GL13K and MSI-594 had good antibacterial activity.