Proceedings of the Canadian Society for Mechanical Engineering International Congress 2020
CSME Congress 2020
June 21-24, 2020, Charlottetown, PE, Canada

Optimization of Marine Bacteria Microencapsulation for the Discovery of Novel Marine Natural Products

Emily Pope[1], Tarteela Alkayyali[4], Sydney Wheatley[4], Christopher Cartmell[1], Jultwahnique McDonald[4], Bradley Haltli[1,3], Ali Ahmadi[4], Russell Kerr[1-3]
[1]Department of Biomedical Sciences, University of Prince Edward Island, PE, Canada
[2]Department of Chemistry, University of Prince Edward Island, PE, Canada
[3]Nautilus Biosciences Croda, PE, Canada
[4]Faculty of Sustainable Design Engineering, University of Prince Edward Island, PE, Canada

ABSTRACT

Marine natural products produced by microbes represent an indispensable resource for various biotechnological applications, including use as medicines, dietary supplements, personal care products and diagnostic agents. However, the discovery of novel natural products is hindered by the fact that only approximately 1% of microbes are currently culturable under traditional laboratory practices as described by the Great Plate Count Anomaly. While various advancements have improved cultivability, the ability to culture "unculturable" microbes remains limiting as existing techniques do not facilitate interspecies cellular communication while maintaining high throughput cultivation. To overcome these limitations, we developed a new *in-situ* microbial growth chamber, termed the microbial domestication pod (MD Pod). The MD Pod uses microfluidics to encapsulate bacteria within agarose microbeads resulting in high-throughput cultivation and isolation while allowing cellular communication and transmission of chemical signals. To assess the feasibility of this concept, three marine species were encapsulated and their subsequent viability was assessed. Additionally, the ideal encapsulating temperature and matrix were determined. Prior to use, the MD Pod was subjected to biocompatibility and contamination testing. The viability and diversity of microbes cultured using the MD Pod will be compared to those cultured using traditional plating methods. It is expected that the use of the MD Pod will result in the culture of a greater diversity of microbes, therefore facilitating the discovery of novel marine natural products.