Purification and Characterization of Outer Membrane Vesicles from Enterotoxigenic Escherichia coli

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Escherichia coli is a Gram-negative bacteria about two microns in length. Enterotoxigenic E. coli (ETEC) is characterized by the production of heat-labile (LT) and/or heat-stable (ST) enterotoxins, which may attack the human digestive tract. Like many Gram-negative bacteria ETEC strains produce outer membrane vesicles (OMVs). Depending on their structure and composition, these OMVs could potentially be used for E. coli vaccines. A vaccine with OMVs would be preferable to a vaccine with whole E. coli cells because OMVs are not viable. The objective of my research was twofold: 1) to produce and purify OMVs from E. coli H10407, an ETEC strain known to produce both LT and ST, and 2) to characterize the vesicles based on the presence or absence of enterotoxins or other harmful proteins. After observing a sample of the preparation on the Cryo Scanning Electron Microscope, it was confirmed that vesicles were present. Silverstaining assays, Western Blots, LT ELISAs, LAL assays, and cAMP tests were performed to identify and quantify toxins in the OMVs. The assays suggested that LT and Lipopolysaccharides (LPS), molecules found in the outer membrane of Gram-negative bacteria that act as endotoxins in animals, were present in the OMVs. This research will be continued to verify these results and determine whether these vesicles could be used in an E. coli vaccine.

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