Bacteria seem to tolerate substantial changes in membrane lipid composition. One may ask which lipid properties are the most important for a functional membrane. Genetically replacing the major native PE in E.coli with foreign nonbilayer (NB) or bilayer glycolipids could restore (i) the curvature stress (NB additives), (ii) diluted the high negative lipid surface charge of a PE-minus, defective clone, and (iii) revealed that a too large headgroup size seemed inhibitory. Several membrane-associated, cellular processes were affected in the modified clones. Proteomic analyses (2D BN SDS-PAGE) of inner membranes showed up/down-regulation of approx. 20% of all membrane proteins, most prominent for the PE-minus and less so for the supplemented clones. Most membrane protein complexes were intact in the various lipid clones (also for PE-minus). The envelope stress sensor kinase CpxA could sense lipid charge and curvature properties in vitro, but several of the responding proteins in vivo were outside the Cpx regulon network, indicating that other regulons are also involved or for direct mechanisms potentially also operating.

Strong overexpression of especially one (monotopic) lipid glycosyltransferase caused massive formation of lipid-enriched membrane vesicles in the cytoplasm. Important steps are binding, penetration, lipid binding, and (potentially) bending by this protein. Such vesicles are promising as overexpression carriers of other membrane proteins. Of 20 tested, 10 showed higher, and a few decreased yields in the vesicle clone.