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As single celled organisms, bacteria constantly experience stressful changes in their environment. For an enteric organism such as *Escherichia coli*, the sudden dilution of nutrients as they travel through the host's colon and into the environment creates significant challenges that must be dealt with through modifications in growth rate, metabolic flux, and cellular composition.

To understand the impact of sudden changes in nutrient availability on *E. coli* physiology, I have analyzed the impact of rapid depletion of carbon on *E. coli* growth and morphology. In previous experiments, scientists have determined that the slow depletion of carbon as bacteria enter stationary phase results in the formation of short, rounded cells. In contrast, my data indicate that rapidly shifting *E. coli* from carbon rich to carbon free conditions does not lead to stationary-like rounded cells, instead resulting in the surprising detachment of the inner plasma membrane from the cell wall and outer membrane. Further experiments indicate that the detachment phenotype persists in the absence of protein, RNA and lipid synthesis, and is independent of the so-called "stringent response" that is typically seen in *E. coli* when subjected to nutrient stress. Membrane detachment is also independent of osmotic conditions and appears to be specific to carbon starvation; rapid depletion of phosphate and nitrogen starvation does not detectably impair the cell envelope structure.

The re-addition of carbon results in inner membrane reattachment to the cell wall. The rate of reattachment differs based on the carbon source introduced into the system. These add back experiments provide a way to visualize the phenomenon in real time. Characterizing this novel carbon starvation phenotype may provide insight into new mechanisms *E. coli* utilize under carbon depleted environments that may simulate depleted conditions met during bacterial host transmission.