Lithium Iron Phosphate Promotes Tumor Cell Growth by Shaping Mitochondrial Function

Teng, Lucy (School: duPont Manual High School)

Water pollution is a critical threat to human health as it can lead to increased cancer risk. More than 22 carcinogens can be found in the drinking water, including heavy metals such as lead, mercury, and cadmium. As the use of lithium-ion batteries is dramatically increasing, it is essential to identify its uncertain potential health hazard. This study investigated the tumorigenesis potential of lithium iron phosphate (LiFePO4), widely used in electric vehicle batteries. An MTT proliferation assay was used to test the influence of LiFePO4 on the growth of cells involving the colon, breast, lung, and brain, four common cancers. The Seahorse Assay and transmission electron microscopy (TEM) were performed to identify the impact of LiFePO4 on mitochondria-relative cell energic metabolism and mitochondrial ultrastructure, respectively. The results suggested that LiFePO4 enhances human MDA-MB-231 and mouse 4T1 breast cancer cell growth but doesn't affect colon or brain cancer cell proliferation. Although a high concentration of LiFePO4 induces mouse TC1 lung cancer cells, no evidence suggests that LiFePO4 impacts human A549 lung cancer cells. The Seahorse Assay indicated that LiFePO4 represses oxygen consumption-related respiration in mitochondria (relating to oxidative phosphorylation) of breast MDA-MB-231 cells while promoting cell glycolytic activity. The TEM suggested that the increase in mitochondria in LiFePO4-treated breast cancer cells could be attributed to mitochondrial fission. Together, these findings reveal the potential of LiFePO4 in promoting breast cancer cell growth and provide insight into mechanisms underlying the LiFePO4-induced breast cancer cell growth by programming/modulating the cell energic metabolism.