

A detailed metabolic pathway map showing various biochemical reactions, enzymes, and metabolites. Key molecules like Glucose-6-P, Fructose-1,6-bis-P, and ATP are visible. The map is color-coded and includes chemical structures for many compounds.

The Lysosome in Nutrient Sensing and Cellular Growth Control

How do the nutrients we consume regulate our growth and homeostasis? Answering this question will help us understand not only how we develop, but also how we age and why we become susceptible to diseases as diverse as cancer, diabetes and neurodegeneration. Our research focuses on the lysosome, an organelle that is emerging as a key signaling node governing the balance between growth and catabolism. We are investigating how the lysosome relays nutrient-derived signals to the master growth regulator, mechanistic Target of Rapamycin Complex 1 (mTORC1) protein kinase. Using advanced live cell microscopy, in vitro biochemical assays, and high throughput protein and metabolite profiling, we are dissecting the rules that control mTORC1 activation at the lysosome and the triggering of its downstream anabolic and catabolic program. Our studies shed light on fundamental mechanisms of nutrient sensing, and point the way to novel strategies to correct faulty mTORC1 signaling in disease.