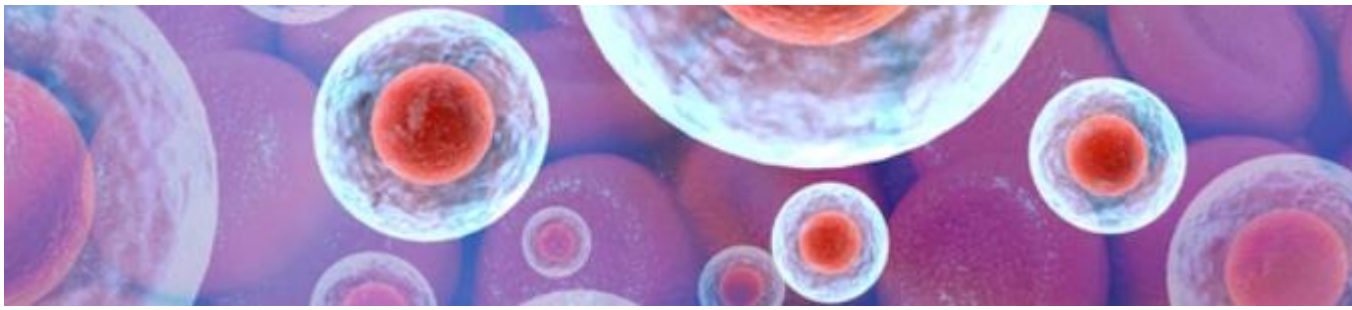
Diabetes & Metabolism

Metabolism describes the series of chemical reactions in a living system. The purposes of metabolism are conversion of nutrients to energy and building blocks, and elimination of nitrogenous wastes. The processes of metabolism are tightly controlled by cellular signaling pathways to maintain the metabolic homeostasis of the system. Altered patterns of metabolism are one of the hallmarks of cancer.

As a trusted CRO, **CD BioSciences** provides a comprehensive panel of solutions covering all aspects of life science research, including metabolism.



Metabolic Signaling Pathways

Metabolism is a term that describes the set of life-sustaining chemical reactions in organisms. It can be divided into two categories: catabolism, the breakdown of molecules, and anabolism, the synthesis of molecules. Metabolism is tightly linked to the availability of nutrients such as proteins, lipids and carbohydrates.

Metabolic pathways are a series of chemical reactions of metabolism, which are catalyzed by a sequence of enzymes. However, metabolic signaling pathways refer to the cellular signaling transductions that respond to metabolic state and regulate cellular events to maintain cell and organismal homeostasis. Dysregulation of these pathways is associated width metabolic diseases such as obesity, type 2 diabetes, as well as cancer and aging.

- **Insulin Signaling Pathway**

  Key Components: INS, INSR, PI3K, Akt, FOXO.

  The insulin signaling pathway is signaling transduction that regulates glucose homeostasis through control of glucose and lipid metabolism. When insulin is released by pancreatic beta cells in response to elevated levels of nutrients, it binds to the insulin receptor, which activates the signaling transduction and leads to cellular processes that promote the uptake of glucose, fatty acids, and amino acids.

  Insulin resistance, or cells fail to respond normally to insulin, is the underlying cause of type 2 diabetes, It also has a strong correlation with neurodegenerative diseases such as Alzheimer's Disease, Parkinson's disease and Huntington's disease.

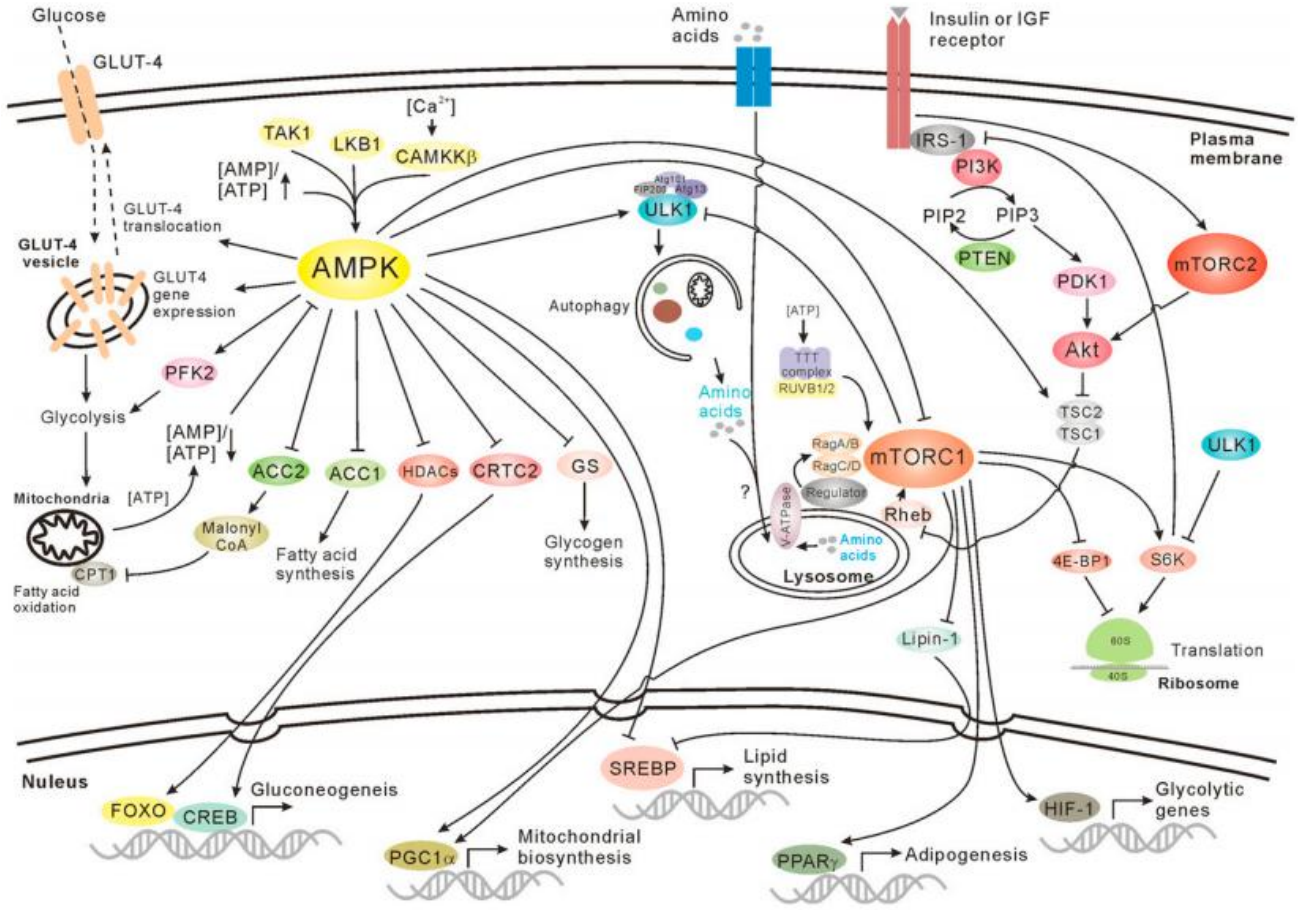
- **mTOR Pathway**

  Key Components: Ragulator, TSCs, Rheb, Rags, mTOR.

The mechanistic target of rapamycin (mTOR), previously referred to as the mammalian target of rapamycin, is a master regulator of metabolism and physiology. It integrates signals from insulin, growth factors, oxygen, and nutrients. mTOR exists in two multiprotein complexes: mTOR complex 1 (mTORC1) and mTOR complex 2 (mTORC2). Deregulation of mTOR activity contributes to diabetes, obesity, ageing, and cancer.
mTOR regulates cell growth, survival, metabolism and immunity and hyperactivation of mTOR promote tumor growth and metastasis. Thus, many mTOR inhibitors have been approved or under developing to treat cancer, such as Rapamycin.

- **AMPK Pathway**

Key Components: LBK1, CaMKK2, AMPK, ACC1, SREBP1, CRTC2.
5' AMP-activated protein kinase, or AMPK, plays a central role in cellular energy homeostasis. It is activated when cellular energy level is low to promote glucose and fatty acid uptake and oxidation. AMPK regulates cellular events including cell growth, metabolism reprogramming and autophagy.
AMPK has been a potential therapeutic target for metabolic diseases such as type 2 diabetes, as well as cancer. The first-line medication for type 2 diabetes, Metformin, is a potent activator of AMPK, and has also shown great potential for cancer treatment.



Nutrient-Sensing and Metabolism Pathways (Yuan *et al.*, 2013)

Reference:

- Yuan, H. X., Xiong, Y., & Guan, K. L. (2013). Nutrient sensing, metabolism, and cell growth control. *Molecular cell, 49*(3), 379-387.

Solutions for Studying Metabolic Signaling Pathway

Our solutions for metabolism research include but are not limited to the following.

- **Regulator Identification**

Identifying gene regulators participating in certain metabolic signaling pathways.

- **Regulator Characterization**

Studying the molecular function of certain regulators in metabolic signaling pathways.

- **Mechanism Study**

Investigating into the mechanism of regulation of certain regulators.

- **Phenotype Analysis**

Analyzing the cellular phenotypes regulated by genes/proteins of interest.

- **Animal Model Generation**

Generating animal models for certain types of metabolic diseases.

- **Chemical Screening**

Screening inhibitors or activators of certain metabolic signaling pathways.

- **Therapy Development**

Developing potential therapies for certain types of metabolic diseases.

CD BioSciences offers cost-effect, high quality and hassle-free metabolism related research solutions to our clients worldwide. We guarantee to deliver our products and results on time. Please feel free to contact us.