

Special Issue

Advances in 5-Aminolevulinic Acid Applications in Medical and Healthcare

Message from the Guest Editors

5-aminolevulinic acid (5-ALA) is the sole source of heme biosynthesis in mitochondria. Heme is crucial in the functioning of cytochrome c and other enzymes involved in oxidative phosphorylation (OXPHOS) and ATP production. Enhancing mitochondrial functions can reduce oxidative stress and lower reactive oxygen species (ROS). Mitochondria produce ATPs by metabolizing carbohydrates, lipids, and proteins.

Mitochondrial deficiency is now focused as the cause of various aging-related diseases. Exogenous 5-ALA enters the heme biosynthesis, energizes mitochondria, enhances metabolisms, and potentially treats diseases like type II diabetes. Heme activates heme oxygenase 1 (HO-1) and induces antioxidative, anti-inflammatory and anti-viral activities. Cancer cells do not use oxygen in mitochondria, which causes ferrochelatase deficiency and accumulates protoporphyrin IX (PPIX), the last precursor of heme. 5-ALA as an exogenous source of PPIX has been applied to photodynamic diagnosis (PDD) and therapy (PDT) as well as sonodynamic and radiodynamic therapy (SDT and RDT) of cancers.

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