

5-Aminolevulinic Acid and its Practical Applications

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Summary

5-Aminolevulinic acid (ALA) is well known as a precursor of tetrapyrrole compounds ubiquitous in plants and animals. A practical fermentation process for ALA production has been established using of *Rhodobacter sphaeroides* under aerobic conditions, opening wide possibilities for applications in medical and agricultural fields, such as photodynamic therapy (PDT) of tumors, plant growth regulation and promotive effects on salt tolerance of plants.

Recently, there has been considerable interest in a new approach to photodynamic therapy in which ALA is administered as a nonphototoxic prodrug, resulting in endogeneous synthesis of the photosensitizer, protoporphyrin (PP). The ALA is a rate-limiting step in the heme biosynthetic pathway; increase in endogenous porphyrin can be artificially induced by an exogenous supply, resulting in remarkable photodynamic effects. The accumulation mechanism of ALA-induced PP is apparently different from that with other exogenous sensitizers. The photodynamic efficiencies of exogenous sensitizers strongly depend on the type of sensitizer and the difference between ALA-induced intracellular monomeric PP and exogenous PP, caused by variation in the PP localization site, plays an important role for the photodynamic efficiency.

The resulting cell damage is remarkable.

A new method to detect cancer by PP produced from mouse tumor has also been described and PP detection in the blood and urine of the mouse and reaction mechanisms are also discussed.