5-aminolevulinic acid used in malignant gliomas

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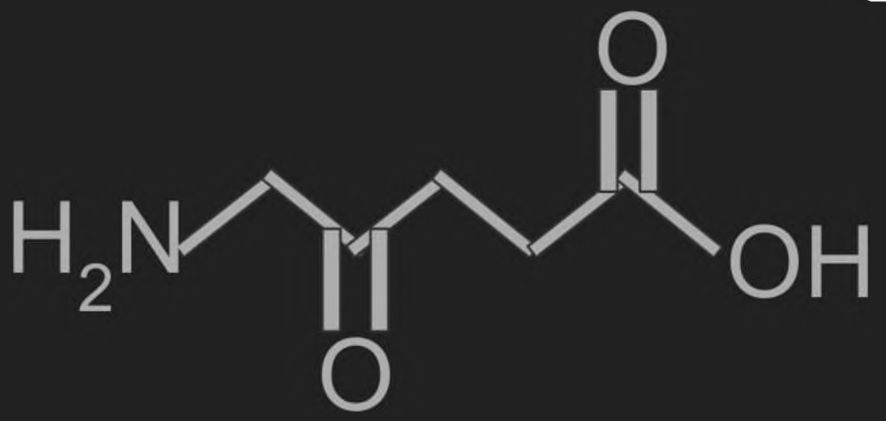
Malignant gliomas

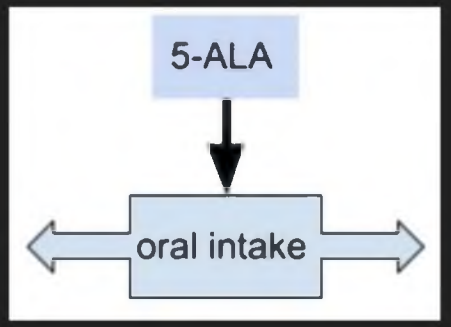
Eighty percent of malignant tumors that develop in the central nervous system are malignant gliomas, which are essentially incurable. Gliomas are the most malignant and aggressive form of brain tumors, and account for the majority of brain cancer related deaths. Treatment for a glioma is customized to the individual patient and may include surgery, radiation therapy, chemotherapy, targeted drug therapy, treatment innovations or observation.

5-aminolevulinic acid (ALA-5)

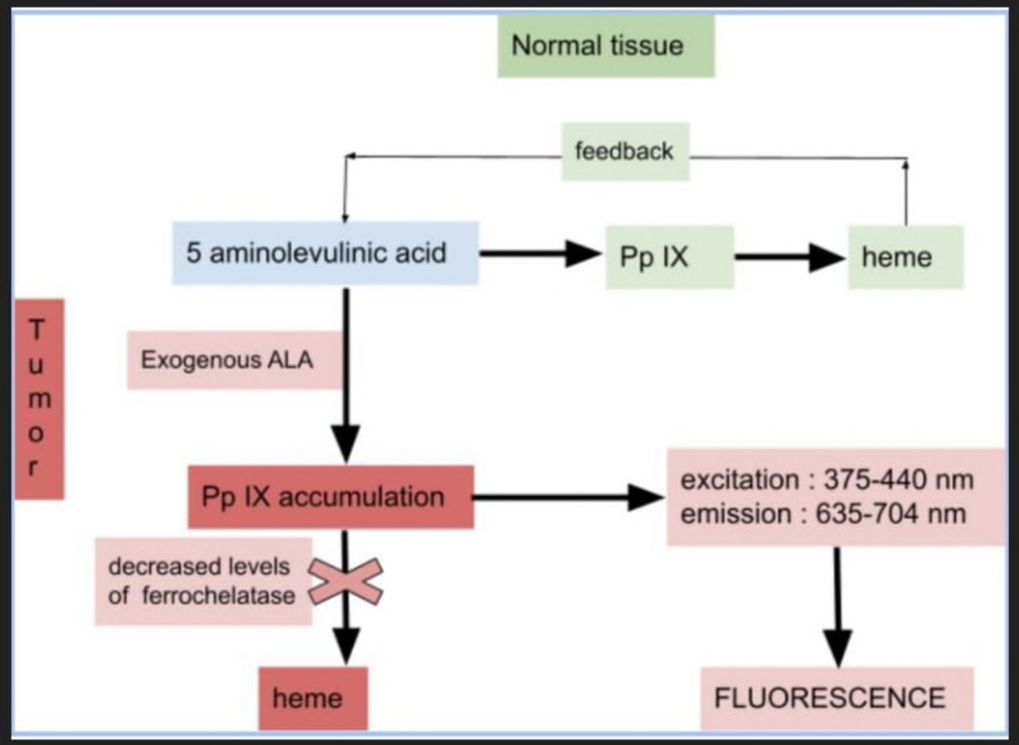


5-Aminolevulinic acid (ALA) is a natural intermediate metabolite produced in the hemoglobin metabolic pathway, has been widely used as an intravital fluorescence marker in the fluorescence-guided resection of malignant gliomas. Although not a photosensitizer itself, 5-ALA is a prodrug that accumulates protoporphyrin IX (PpIX) in the mitochondria of glioma cells; PpIX acts as a photosensitizer.

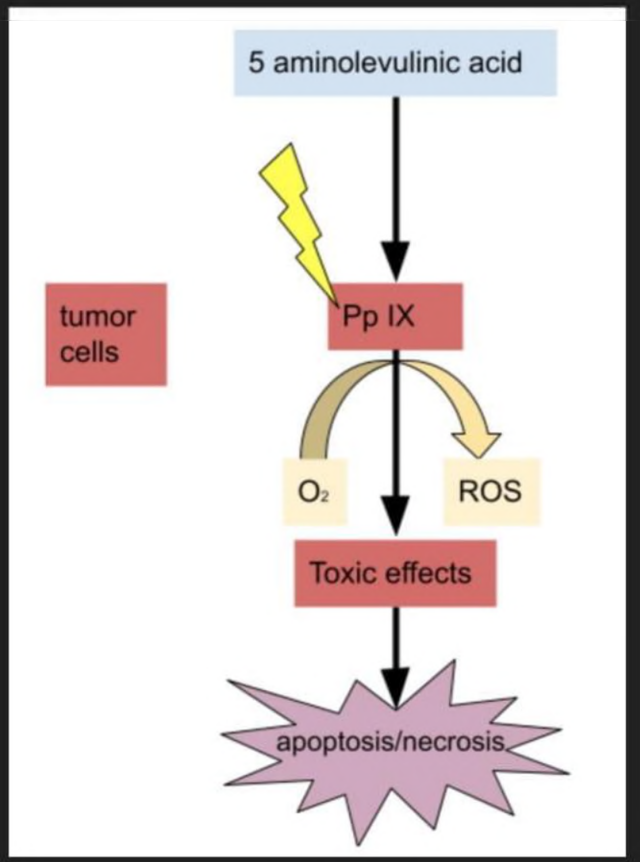
Mechanism of action



Photodynamic diagnosis



Photodynamic therapy



Significance in medicine

Use of 5-ALA permits selective tumor targeting due to the intracellular metabolism of 5-ALA.

PDT therapy utilizes the photosensitizing porphyrin precursor 5-ALA to generate ROS that are cytotoxic to brain tumor cells. The cytotoxicity mechanisms of PDT therapy lead to the death of tumor cells. This increases the chances of completely removing the cancer cells. ALA-5 in diagnostic therapy applied intraoperatively using the fluorescence phenomenon. This allows for maximum visualization of tumor margins in real time, allowing for maximum resection and ensuring safety of surrounding tissues.

References

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