

## **Phototherapy and malignancy: Possible enhancement by iron administration and hyperbaric oxygen.**

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### **ABSTRACT**

Photodynamic therapy (PDT) is a new therapeutic approach for the treatment of malignant tumors. Hyperbaric oxygen (HBO(2)) shows beneficial effects in various modalities of cancer interventions. Tumor cells tend to accumulate large amount of iron. There is interaction between tissue content of oxygen, iron, free radical production and tissue damage. Accumulation of intracellular iron is necessary for the production of oxygen radicals. HBO(2) increases tissue oxygen and hydrogen peroxide production in the cells. Malignant cells require iron, and exhibit more transferrin receptors. The photodynamic sensitization of human leukemic cells is achieved with accumulation of porphyrins stimulated by 5-aminolaevulanic acid (ALA) plus hemin. Further, a significant improvement in tumor response is obtained when PDT is delivered during hyperoxygenation. When PDT is combined with hyperoxygenation, the hypoxic condition is improved and the cell killing rate at various time points after PDT is significantly enhanced. Photosensitization with use of porphyrins is used with HBO(2) and PDT for treatment of certain tumors. PDT with ALA is used for treatment of actinic keratosis (AK). The combination of iron administration (by injection or oral rout), hemin, or transferrin, as a source for iron, HBO(2) as a source of oxygen under pressure and PDT as a source of generating free-radical tissue damage may be useful in the treatment of tumors. The possibility of combining HBO(2), iron, light and local photosensitizers to overcome skin tumors deserve extensive laboratory and clinical research work. Conclusively, iron, HBO(2), and PDT may have synergistic effect to hamper tumor cells