Oxygen-dependent delayed fluorescence measured in skin after topical application of 5-aminolevulinic acid.

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Abstract

Mitochondrial oxygen tension can be measured in vivo by means of oxygen-dependent quenching of delayed fluorescence of protoporphyrin IX (PpIX). Here we demonstrate that delayed fluorescence is readily observed from skin in rat and man after topical application of the PpIX precursor 5-aminolevulinic acid (ALA). Delayed fluorescence lifetimes respond to changes in inspired oxygen fraction and blood supply. The signals contain lifetime distributions and the fitting of rectangular distributions to the data appears more adequate than mono-exponential fitting. The use of topically applied ALA for delayed fluorescence lifetime measurements might pave the way for clinical use of this technique.

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