

Noninvasive Measurement of Carboxyhemoglobin in Cystic Fibrosis Patients by Pulse CO-Oximeter

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Carboxyhemoglobin levels may be elevated by the inspiration of environmental carbon monoxide or as a result of its endogenous production by inducible heme oxygenase, which is a stress protein that breaks down heme. Heme breakdown products, including carbon monoxide, have antioxidant, anti-inflammatory, and cytoprotective effects. Increased exhaled carbon monoxide has been measured in active smokers, sepsis, and in a number of inflammatory pulmonary diseases including cystic fibrosis (CF).

Carboxyhemoglobin can now be measured noninvasively by pulse CO-oximetry (SpCO) within a range of $\pm 2\%$ by the Rainbow-SET Rad-57 Pulse CO-Oximeter (Masimo Inc., Irvine, CA). To become familiar with this device, staff measured SpCO during routine outpatient visits at a Pediatric Pulmonary and Cystic Fibrosis Center.

Among the outpatients were 48 patients with CF, who had an average SpCO of $7.1\% \pm 5$ [SD] (range 0–20). When SpCO was compared to the forced expiratory volume in 1 sec at the same visit, there was a moderate positive correlation ($r=0.67$, $p<0.001$). SpCO did not correlate with a history of active or passive tobacco smoke exposure in patients with CF.

This report shows that carboxyhemoglobin levels may be measured by pulse CO-oximetry in patients with CF and suggests that elevated levels may correlate with better pulmonary function. Further controlled, prospective studies are needed to determine if this noninvasive test may be useful in evaluating the severity of CF or aiding in its treatment.