

Anesthesiology
68:171, 1988

Methylene Blue and Pulse Oximetry Readings: Spuriouser and Spuriouser!

To the Editor:—In their discussion of the effect of methylene blue on pulse oximetry readings, Kessler *et al.*¹ state that, "Should any doubt exist, an arterial blood sample should be obtained to confirm PaO₂ and hemoglobin saturation." Such a sample will only facilitate an accurate estimate of PaO₂ and a *calculated* saturation (based on the oxygen-hemoglobin dissociation curve). Hemoglobin saturation (SaO₂) is normally measured using a laboratory co-oximeter, such as the IL 282 (Instrumentation Laboratory, Lexington, MA), and these devices are also subject to error in the presence of methylene blue, tending to underestimate oxyhemoglobin and overestimate methemoglobin (MetHb).^{*} No figures are available to quantitate this interference caused by blue dyes.^{*}

Where a suspiciously high reading for MetHb is obtained from the co-oximeter, the data may be verified by adding a reducing agent (sodium dithionite) to the blood sample and reanalyzing. If the original results are valid, %MetHb will be reduced and read $\pm 1.0\%$ on the

IL 282. If the results are not valid, as might be the case in the presence of a methylene blue, the %MetHb will remain unchanged or will not be reduced to less than 1.0%.[†]

Thus, while anesthesiologists should be aware of spurious pulse oximeter desaturation in the presence of blue dyes, they should also be aware that the usual methods for confirming SaO₂ may also produce spurious results.

† The 282 CO-Oximeter Abnormal Data Interpretation Guide. Instrumentation Laboratory, Lexington, MA 02173, 1979.

JAMES B. EISENKRAFT, M.D.
Associate Professor of Anesthesiology
Mount Sinai School of Medicine
New York, New York 10029

REFERENCE

1. Kessler MR, Eide T, Humayun B, Poppers PJ. Spurious pulse oximeter desaturation with methylene blue injection. *ANESTHESIOLOGY* 65:435-436, 1986

(Accepted for publication September 18, 1987.)

* Operator's Manual. IL 282 CO-Oximeter. Instrumentation Laboratory, Lexington, MA 02173, p. 1.2., 1978.

Anesthesiology
68:171-172, 1988

In Reply:—Dr. Eisenkraft points out that a sample of blood containing methylene blue (absorption peak of 668 nm) will indicate the presence of desaturation when that sample is injected into a laboratory co-oximeter (IL 282) as it similarly causes the appearance of a desaturation with the pulse oximeter.¹

It should also be noted that a laboratory co-oximeter differs significantly from a pulse oximeter in the number of wavelengths used in the assay and the complexity of the algorithm for calculating per cent oxygen saturation. Also, a different model co-oximeter might assay and calculate per cent oxygen saturation in a different way.

The IL 282 uses four wavelengths in its assay (535, 585, 594, and 626 nm). The instrument used at my institution (Radiometer OSM-3) samples six wavelengths of light (535, 560, 577, 622, 636, and 670 nm), and assigns a relative contribution (or factors out an interference) at each wavelength to calculate values for

oxyhemoglobin, methemoglobin, carboxyhemoglobin, and total hemoglobin). The OSM-3, according to the manual, gives a falsely *elevated* per cent oxygen saturation and a falsely decreased per cent methemoglobin in the presence of 60 mg/liter of methylene blue.

I have recently used the OSM-3 to sample blood containing methylene blue at a higher concentration than referenced in the manual—600 mg/liter. This resulted in a 10% decrease in oxygen saturation, a 30% decrease in total hemoglobin content, an indication of the presence of sulfhemoglobin, a turbidity error, and no methemoglobin. The same sample containing indigo carmine (absorption peak approximately 610 nm)² produced a 22% decrease in oxygen saturation and showed a methemoglobin content of 24%. Fluorescein dye produced no change in oxygen saturation, but showed the presence of 9.6% carboxyhemoglobin.

Therefore, the suspected presence of an interfering substance in a blood sample should alert the clinician to