



# Laboratory Medicine Bulletin

## Change in reporting for carboxyhemoglobin (COHb) and methemoglobin (MetHb)

March 8, 2019

Starting March 12, 2019, Providence Health Care will report all levels of carboxyhemoglobin (COHb) and methemoglobin (MetHb) for arterial blood gas panels and rapid metabolic panel (RMP), regardless of whether they were specifically ordered. This policy is in contrast with previous reporting procedures where the routinely measured COHb or MetHb fractions were only reported if greater than 0.100 (10.0%). This decision was made in consultation with physicians from the British Columbia Drug and Poison Information Centre in order to facilitate earlier detection of occult carbon monoxide poisoning.

COHb fractions of up to 0.181 (18.1%) have been noted incidentally in patients presenting to the St. Paul's Hospital Emergency Department without carbon monoxide (CO) exposure sources other than cigarette smoking. Elevated levels in smokers are hard to interpret as the CO exposure could be solely due to smoking but a correlation between smoking and COHb fraction is indirect. There is wide variability in COHb levels in smokers depending on how much the person smokes, type of smoking (i.e. cigarette vs. hookah), time from last smoking to sampling, smoking environment (i.e. outdoors vs. in a confined room with other smokers), and whether oxygen was administered between last smoking and sampling<sup>1</sup>.

A review of the literature suggests that chronic smokers (>30 cigarettes per day) can have an average COHb level of 0.120 (12.0%), and levels up to 0.180 (18.0%) have been observed<sup>1</sup>. A case report described a COHb level of 0.242 (24.2%) in a patient with a prolonged history of cigarette use<sup>2</sup>. In hookah (water pipe) smokers, case reports have described COHb levels of up to 0.311 (31.1%)<sup>3,4</sup>. In non-smokers, COHb levels are expected to be lower, up to 0.020-0.030 (2.0%-3.0%)<sup>1</sup>.

### Take Home Message:

- Providence Health Care will report all levels of COHb and MetHb for arterial blood gas panel and rapid metabolic panel (RMP)
- Carboxyhemoglobin:
  - In general, COHb levels greater than 0.030 (3.0%) in non-smokers and greater than 0.120 (12.0%) in smokers are abnormal and should prompt consideration of sources of carbon monoxide exposure.
  - The combination of elevated COHb levels and symptoms consistent with CO poisoning require treatment and investigation for possible exposure source.
  - Even COHb levels less than 0.120 (12.0%) may cause no symptoms or only minimal, vague symptoms, but can still be indicative of significant exposure, require treatment, repeat levels, and/or investigation of potential exposure source.
- Methemoglobin:
  - Elevated methemoglobin levels (greater than 0.050 (5.0%)) should prompt consideration of possible causes of increased methemoglobin (e.g. medications, hereditary causes).

**For questions regarding treatment or evaluation of carbon monoxide poisoning or methemoglobinemia, call BC Drug and Poison Information Centre at 604-682-5050 or 1 (800) 567-8911.** For lab related questions, please contact

Catherine Cheng, MD FRCPC  
Medical Biochemistry Resident  
[ccheng5@providencehealth.bc.ca](mailto:ccheng5@providencehealth.bc.ca)

Angela Fung, PhD FCACB  
Clinical Chemist  
[afung7@providencehealth.bc.ca](mailto:afung7@providencehealth.bc.ca)

Andre Mattman, MD FRCPC  
Medical Biochemist  
[amattman@providencehealth.bc.ca](mailto:amattman@providencehealth.bc.ca)

### References:

1. Boehm, R. E. et al. Smoking fewer than 20 cigarettes per day and remaining abstinent for more than 12 hours reduces carboxyhemoglobin levels in packed red blood cells for transfusion. *PLoS One* 13, e0204102 (2018).
2. Sen, S., Peltz, C., Beard, J. & Zeno, B. Recurrent carbon monoxide poisoning from cigarette smoking. *Am. J. Med. Sci.* 340, 427–428 (2010).
3. Cavus, U. Y., Rehber, Z. H., Ozeke, O. & Ilkay, E. Carbon monoxide poisoning associated with narghile use. *Emerg. Med. J. EMJ* 27, 406 (2010).
4. La Fauci, G., Weiser, G., Steiner, I. P. & Shavit, I. Carbon monoxide poisoning in narghile (water pipe) tobacco smokers. *CJEM* 14, 57–59 (2012).