



### **K14 An Analysis of Carboxyhemoglobin in Postmortem Blood and Epidemiology Data of Suicide Autopsy Cases From 2011–2016 in Taiwan**

*Chu-An Yang, MS\*, Institute of Forensic Medicine, New Taipei City 23548, TAIWAN, REPUBLIC OF CHINA; Hsiu-Chuan Liu, MS, Institute of Forensic Medicine, Taipei, TAIWAN, REPUBLIC OF CHINA; Ray H. Liu, PhD, Forensic Science Review, Vancouver, WA 98685; Dong-Liang Lin, PhD, Institute of Forensic Medicine, New Taipei City 23548, TAIWAN, REPUBLIC OF CHINA*

**Learning Overview:** After attending this presentation, attendees will gain insights regarding: (1) factors that are important to the analysis of Carboxyhemoglobin (COHb) in postmortem blood specimens, and (2) trends and epidemiological data of Carbon Monoxide (CO) poisoning deaths in Taiwan during the 2011–2016 period.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by improving forensic laboratories' analysis of COHb in postmortem blood specimens and helping medical examiners' determination on cause of death in CO poisoning cases.

Poisoning-related death statistics in Taiwan, regularly provided by the Ministry of Justice's Institute of Forensic Medicine, indicated the number of CO-poisoning cases has been consistent and significant in recent years. The most common cases were suicidal deaths facilitated by coal burning. The measurements of COHb in postmortem blood specimens could be unreliable and difficult due to putrefaction and other factors. The purpose of this study was to evaluate whether test results could be affected by: (1) blood from different sources (heart, pelvis, and thoracic cavity); and (2) specimen storage temperature (–20°C, 4°C, 25°C, and 40°C). In addition, suicide cases (with autopsy) were studied to reveal the trend of CO-poisoning deaths in Taiwan during the 2011–2016, six-year period to aid in the formulation and administration of suicide prevention policies in Taiwan.

The ABL80 FLEX CO-OX blood gas analyzer was used to determine COHb concentration in test specimens, following the operation guide provided by the manufacturer. It was found to be easy to operate, requiring a short test time and small sample volume (around 70µL). Test results indicated: (1) the ranges of intra-/inter-day precision and accuracy were 0.00%–6.37% and 98.1%–104.7%, respectively; (2) the best results for postmortem blood specimens came with two-fold dilution (with deionized water and 0.9% sodium chloride aqueous solution), as specimens provided were often too thick with a small volume; (3) no significant difference was found among specimens collected from different parts of the same person; and (4) COHb concentration was stable through 28 days when specimens were refrigerated at –20°C or 4°C.

This method was successfully applied to the analysis of postmortem blood specimens from forensic cases in Taiwan for the 2011–2016 period. Statistics of autopsy cases (404 total) during this six-year period revealed: (1) the number of suicidal deaths beginning with 2011 were: 17, 19, 18, 30, 18, and 18 (120 total); (2) there were 108 CO-poisoning suicides by coal burning—nearly 90% of the total number of suicide cases; (3) the number of male victims was significantly higher than female (272 vs. 132); (4) most victims (71) were 31–40 years old; (5) the peak periods were January/February and September/October; and (6) most cases were found in residence. The range, mean, and median of COHb concentrations found in the 120 suicide case specimens were 10.1%–91.1%, 59.9%, and 62.9%, respectively. Alcohol, sedatives, and antidepressants were the most commonly found drugs in these specimens, but with concentrations below their respective lethal levels.

#### **Carboxyhemoglobin (COHb), Postmortem Blood Specimen, Epidemiology**