

Spectrophotometric determination of carboxyhemoglobin in a sample of automobiles mechanics occupationally exposed to carbon monoxide

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Resumo: *State of art:* Carbon monoxide (CO) is a toxic, colorless gas that results from the incomplete combustion of coal and other petroleum-derived materials (Topacoglu, Katsakoglou, & Ipekci, 2014). Within anthropogenic sources of carbon monoxide emissions, air pollution from car emissions accounts for about 75% (Fernícola & Lima, 1979). Inhalation of this gas is considered to be potentially toxic to the body, resulting in a hemoglobin variant with reduced oxygen transport capacity, carboxyhemoglobin (COHb) (Fierro, O'Rourke, & Burgess, 2001). As the endogenous concentration of COHb in a healthy adult varies from 0.1% to 1% (Malheiro, 1991), higher values can lead to respiratory problems, visual perception impairment and manual dexterity, headache and nausea (Barbosa, 2015).

Goal: The present study aimed to determine the carboxyhemoglobin by the spectrophotometric method in 8 mechanics workers in automobile repair shops (test group) and a control group (non-mechanical participants) composed of 16 individuals and verify if the years of labor activity as well as the use of personal protective equipment (PPE) influenced the values of this parameter.

Methodology: A simple descriptive level II research study was developed to find relationships between variables. It is considered to be a case-control study and is further classified as analytical, observational and on what concerns time is transversal and retrospective (Fortin, 1999).

Ethical Implications: For this research, volunteers were proposed to read an informed consent, such as signing a statement, according to a Helsinki Declaration of the World Medical Association. Therefore, all the data collected through completed survey by the participants are confidential and kept the anonymity of all elements. Participants were informed of the entire investigation process and had an opportunity to clarify doubts.

Results: The results showed that the blood concentration of COHb in the test group was on average $0.653 \pm 0.087\%$ and in the control group, it was on average $0.477 \pm 0.133\%$. Statistically significant differences were observed in relation to the carboxyhemoglobin values between the test group and the control group ($p = 0.002$); however, no statistically significant differences were found between the years of work activity ($p = 0.711$) and use of PPE ($p = 0.392$) when compared to the carboxyhemoglobin values of the test group. Although statistically significant differences were obtained in COHb values between the two groups, values higher than 1% in the test group (average of 0.653%) were not obtained, which could correspond to a continuous exposure at 5 ppm of CO in the air, or from 8 hours to 7 ppm or 1 hour to 20 ppm (Fernícola & Lima, 1979).

Conclusions: In this study, although no altered COHb values were found in the test group, new lines of research on this subject are recommended, aiming to broaden and deepen the field of knowledge, aiming at the protection of this type of workers.

Palavras-chave: carboxyhemoglobin, mechanics, carbon monoxide, occupational exposure

Referências bibliográficas

- Barbosa, M. M. (2015). *Tratamento das intoxicações pelo monóxido de carbono*. Tese de mestrado integrado em Medicina apresentada na Faculdade de Medicina da Universidade do Porto, Porto.
- Fernícola, N. A. G. G. de, & Lima, E. R. (1979). Avaliação do grau de exposição de amostras populacionais de São Paulo (Brasil) ao monóxido de carbono. *Revista de Saúde Pública*. June. 13(2), 151-158. doi.org/10.1590/S0034-89101979000200011
- Fierro, M. A., O'Rourke, M. K., & Burgess, J. L. (2001). Adverse health effects of exposure to ambient carbon monoxide. *University of Arizona Report*.
- Fortin, M.-F. (1999). *O Processo de Investigação - Da concepção à realização*. (1ª ed.). Lusociência.
- Malheiro, A. (1991). *Determinação espectrofotométrica da carboxiemoglobinemia em indivíduos expostos ocupacionalmente ao monóxido de carbono*. Tese de mestrado apresentada na Universidade de São Paulo, São Paulo.

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