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Abstract

Every Drop Counts—The Current Methods for Determining the Quality of Human Milk †

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Abstract: Background and objectives: Human milk is the golden standard in infant nutrition. A very important segment of nutritional support for premature children is milk banks. In milk banks, during the process of storage and pasteurization, the characteristics of milk change, and consequently, its quality changes as well. Current electrochemical techniques (green analytical chemistry) can be used to determine the quality of milk regarding its total antioxidant capacity (TAC). Methods: The application of various electrochemical methods, such as differential pulse voltammetry, cyclic voltammetry, polarography, or potentiometry, enables monitoring of the quality and redox capacity of human milk and infant food. Changes in the TAC of human milk were examined after thermal treatments, which are commonly used in milk banks, as well as after supplementation with a fortifier. Results: The results obtained using electrochemical methods were compared to the most commonly used spectrophotometric methods for monitoring total antioxidant capacity. The obtained results showed that electrochemical methods can overcome the limitations of spectrophotometric methods, such as lower sensitivity, slower reaction and insensitivity at higher antioxidant concentrations. Cyclic and differential pulse voltammetry methods can be successfully applied as fast methods for testing milk quality in milk banks and clinical studies. Conclusion: The tested electrochemical methods are fast, cheap, and reliable in determining TAC since they are based on direct measurement of electron-donating components of milk and enable the quantitative determination of TAC in human milk and infant food. They are very important for routine and daily determinations of TAC in infant food, as well as for the control of milk freshness, especially after using fortifiers in neonatal units.

Keywords: human milk; premature children; milk bank; total antioxidant capacity; electrochemical methods

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