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Histamine determination using potentiometric detection coupled to sequential injection analysis

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Histamine is a biogenic amine that results from enzymatic decarboxylation of the amino acid histidine. It is synthetized and released from many cells (mast cells, basophils, platelets, histaminergic neurons, etc.) [1]. A strongly potential therapeutic exploitation in allergy, inflammation, autoimmune disorders and cancer has been reported in preclinical data for histamine [2]. It is the most important inflammatory mediator during an allergic reaction and plays a significant role in anaphylaxis cases [3]. Furthermore, histamine is regarded as one of the most important biomarkers for quality control during the food production and transportation [4].

Different methods have been applied into determination of histamine, such as GC, HPLC, capillary electrophoresis and biochemical assays [5]. However, potentiometry have been described as an alternative due to being simpler, faster, portable and cheaper than the other analytical methods referred above [4].

In the present work, the histamine sensor is optimized by using different membrane polymers, ionophores, solvent mediators, as well the presence of anionic additive and the multiwalled carbon nanotube (MWCNTs). The sensor with the best analytical response is composed of 1.0% (w/w) of cucurbit[6]uril, 66.8% (w/w) of 2-nitrophenyl octyl ether, 29.8% (w/w) of polyvinylchloride, 0.3% (w/w) of potassium tetrakis(4-chlorophenyl) borate and 2.0% (w/w) of MWCNT. The histamine sensor´s performance is characterized by a slope of 30.9±1.2 mV dec^{-1}, a detection limit of (3.01±0.61) $\times 10^{-7}$ mol L^{-1} and a lower limit of linear range of (2.99±0.00) $\times 10^{-7}$ mol L^{-1}.

Sequential injection with this sensor, gives rise to similar response characteristics when volume of 195µL was propelled at a flow-rate of 30 µL s^{-1}.

The optimal system will be applied to the analysis of real samples (biological fluids). Due to the complexity of the matrix, different pre-treatments are under study by using different extraction processes.

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