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TWO CENTURIES OF BIOELECTROCHEMISTRY: SINCE LUIGI GALVANI UP TO NOW.*

by Giulio Milazzo

Honorary President of the Bioelectrochemical Society
Piazza G.Verdi a Roma

As the very father of Bioelectrochemistry Luigi Galvani must be considered. He was physician professor of anatomy at the Archiginnasio (ancient name of the University of Bologna). His first publication with the latin title "De Viribus Electricitatis in Motu Musculari Commentarius" (Note on the influence of Electricity on Muscular Motion) appeared in 1791, while the experiments were carried out 5 years before in 1786 observing the muscle contraction in the legs of a dead frog pending on the banister of the balcon when touching its nerves with a pair of scissors during a storm.

This discovery was followed by a long polemics with the physicist Alessandro Volta, and by a tentative, more correct interpretation by Johan Wilhelm Ritter.

After this somewhat dramatic start a period of silence followed, during which few scientists were concerned with (really) bioelectrochemical research. Worthwhile to be mentioned are Leonor Michaelis (born 1875; physician, who investigated redox reaction involving ionic species occurring in living bodies); David Keilin (born 1887, chemist, who investigated redox processes in respiratory chain); René Bernard Wurmser (born 1890, chemist, who introduced potentiometric technique in biological research); and more recently two Nobel Prices: Albert Szent Giorgy (born 1893, who introduced semiconductor theory): and Ilia Prigogine (born 1917, who developed the treatment of biological phenomena using then thermodynamics of non reversible processes).

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Bioelectrochemistry became again object of interest since about 40 years, rapidly covering very different fields. Following examples are then mentioned giving some more details; Chemical metabolism; Membrane phenomena; Photosynthesis; Active transport; Electroanaesthesia; Transmission of information; Electropermeabilization, Ilectroporation and gene transfer. Medical diagnosis; Electrocardiography and electroencephalography.

ELECTROCHEMICAL BEHAVIOUR AND DETERMINATION OF CYTARABINE

D.DOĞRUKOL and M.TUNÇEL

Department of Analytical Chemistry, Faculty of Pharmacy, University of Anadolu, Eskişehir, Turkiye.

ABSTRACT

An electroanalytical study of the cytarabine reduction process at a dropping mercury electrode in aqueous supporting electrolyte solution using direct current polarographic technique has been carried out. The optimum parameters were found as 1000 dyne.cm^{-2} pressure on the mercury reservoir, 1s drop time, 4 mV.s^{-1} scan rate and 5.50-6.60 pH range. The reversibility of the reduction on the mercury electrode was ascertained as quasi-reversible and the polarographic current was mainly diffusion controlled. The results obtained by DC, SIAP and DP polarography allowed a method developed for the determination of cytarabine in the 1x10^{-4} - 5x10^{-4} mol.L^{-1} concentration range. Good results were obtained by applying the DC polarographic technique to the determination of cytarabine in a pharmaceutical preparation.

Keywords. Cytarabine determination, direct current polarography.

INTRODUCTION

Cytarabine (ara-C, 1-β-D arabinofuranosylcytosine) is a potent drug which is used in the treatment of acute myelegenous leukemia. After administration, cytarabine is converted to the active metabolite, cytosine 1-β-D arabinofuranoside-5'-triphosphate in the body. This metabolite supresses DNA synthesis both by inhibiting DNA polymerase and incorporating into the DNA molecule(1,2).

Cytarabine is stable both in solid state and in acidic media, although it is degradable by hydrolysis in neutral and basic aqueous solutions(3). Hydrolytic deamination of the molecule leads to the formation of uracil arabinoside (ara-U) which is a therapeutically