THE INTRODUCTION OF PHASE-CONTRAST MICROSCOPY (PHACO) INTO URINE SEDIMENT (USED) EXAMINATION

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Introduction and Aims: Today, PHACO is the technique recommended by the international guidelines for Used examination. This study describes the main historical steps which led to the introduction of PHACO in urinalysis.

Methods: The research was carried out by the search and analysis of the original contributions (both papers in scientific journals and monographs) on the subject.

Results: The principle of PHACO was discovered in the 1930s by the Dutch physicist Frits Zernike (1888-1966) who, for this discovery, was awarded the Nobel Prize (1953). PHACO started being commercialized by Zeiss-Jena in 1942, and in 1951 a first monograph on its principle and clinical applications was published in the United States. In 1957, the Atlas "El sedimento urinario. Atlas microfotográfico en microscopia directa y en contraste de fase" was published in Barcelona, Spain, by Luis Daufi Moreso (1927-2013) and Francisco Preto Alboiés. This work, which had only a local circulation and is totally forgotten today, clearly demonstrated the advantages of PHACO over bright field microscopy in the identification of most urine sediment particles. In 1968 and in 1971 two works focused on the use of PHACO for Used examination were published: one being the paper "Identification of elements of urinary sediment with phase-contrast microscopy. A simple method", which appeared in JAMA, written by Chicago nephrologists, led by Robert Kark (1910-2002), the other being the monograph "Hand Atlas of the Urinary Sediment. Bright-Field, Phase-Contrast and Polarized Light" (Munksgaard, Copenhagen), written by the Danish nephrologist Edwin Spencer and his friend Ib Pedersen, an engineer. Both works had international circulation and were instrumental in stimulating the use of PHACO. Between 1968 and 1974 also urologists, among whom the famous Spanish Luis Cifuentes Delatte (1907-2005), wrote on the subject, with emphasis on the reliable identification of neoplastic cells attainable with PHACO. Between 1975 and 1982 further contributions came from Sweden (by Bengt Lindqvist and Anders Wahlin) and France (by Hélène Pellet and coworkers), some of which were focused on the urinary findings in special conditions such as endemic nephropathy, hydronephrosis, the newborn, and kidney transplant. In 1982, the seminal paper "Hematuria: a simple method for identifying glomerular bleeding", published in Kidney International by Australian Kenneth Fairley and Douglas Birch, contributed to rekindle the interest for Used examination and the use of PHACO among nephrologists.

Conclusions: In spite of all these contributions, the use of PHACO is still limited today (about 14% in general clinical laboratories in one European country, as shown by a survey published in 2010). However, the recent incorporation of PHACO in an automated urine sediment analyzer might represent a major historical step in the diffusion of this technique, whose advantages over bright filed microscopy have been demonstrated by several investigators worldwide in the last 60 years.