

## Sysmex UD-10 should Accompany UF-5000 in Managing Atypical Cells in Urine

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### Abstract

Sysmex UF-4000/5000 uses fluorescence flow cytometry technology and hydrodynamic focusing for urine sediment analysis, where particles are stained by specific fluorochromes for nucleic acids and surface structures and then sent through the semi-conductor laser beam. Atypical cells show side fluorescence and scattered light properties indicating their enlarged nuclei and increased nucleus/cytoplasm ratio. If more investigation of certain particles like atypical cells is requested Sysmex UD-10 presents images captured by an internal camera. Many instruments in the market serve digital images of urine samples. Evaluation of on-board images will strengthen the efficiency of automated urine analyzers particularly considering the atypical cells parameter.

**Keywords:** Atypical cells; Automatic analyzer; Cancer; Cytology; Urinalysis; Urothelial carcinoma

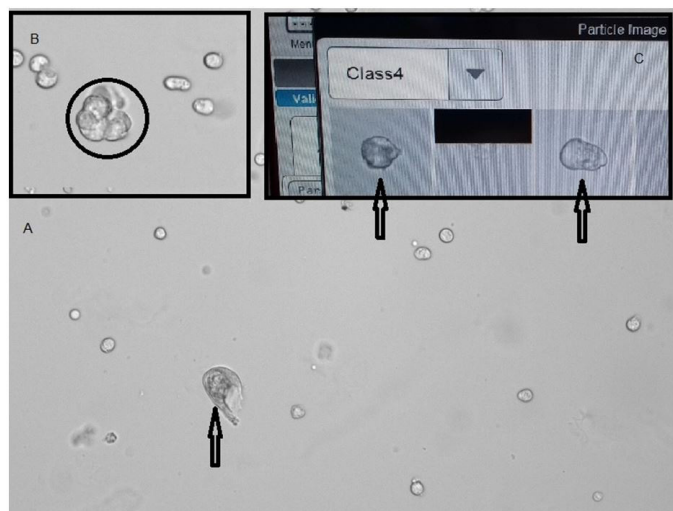
### Introduction

Manual microscopy in urine sediment analysis has become obsolete after the introduction of efficient automated urine analyzers. It is still respected as the gold standard but apparently the straggle between automation and manual examination seems to be over in clear advantage of machines. The instruments in the market can be simply divided into two categories according to the methodology they use: microscopy based instruments and flow cytometry based instruments. Accordingly, some use built-in optic lenses to “see” while some others use laser beams and voltage sensors to compose a sense of “vision”. All instruments use software systems to turn the vision into a definition. These instruments can report up to 25 parameters including: red blood cells, white blood cells, epithelial cells, casts and bacteria. Subtypes of epithelial cells like renal tubular, urothelial or squamous epithelial cells are reported in some instruments but “atypia” of epithelial cells is not a common parameter. Actually, atypical epithelial cells have never been a matter of concern in urinalysis including the age of manual microscopy.

Sysmex UN-Series Automated Urinalysis Instruments (Sysmex Corporation, Kobe, Japan) very lately introduced “Atypical cells” parameter. It is presented as a research parameter, namely reported by the instrument but not validated or presented in the patient reports. Sysmex UN seems to be the first instrument to challenge diagnosing neoplasms of urinary track in urinalysis. The study by Anderlini *et al.* in 2015 was the first attempt to search the efficacy of identification of atypical cells in an automated urinalysis instrument, where expert pathologists revisited images of particles classified by the instrument as “unclassified” [1]. They examined black and white images of fresh, unstained and uncentrifuged samples taken with the built-in camera of the instrument. The images allowed them to search for features of atypia depending on size, shape, texture characteristics of cells. In 2020, Ren *et al.* evaluated the performance of “Atypical Cells” parameter of Sysmex UF-5000 in patients with a suspected diagnosis of urothelial carcinoma [2]. They compared the results of UF-5000 urine analyzer with histologic and cytologic results. The authors in this study did not prefer to perform manual or digital microscopic examination of urine sediments.

Sysmex UN-Series is a modular system which allows configuration of instruments that best suits the workflow needs of laboratories. In addition, the reflexive and complementary combination of technology allows laboratories to harness the walkaway efficiency of automated particle counting via flow cytometry but still allows for reflexing to digital image review for those abnormal samples that require it. The UC-3500 uses test strips for chemical analysis of the urine. UF-4000/5000 uses fluorescence flow cytometry technology and hydrodynamic focusing for urine sediment analysis, where particles are stained by specific fluorochromes for nucleic acids and surface structures and then sent through the semi-conductor laser beam. Counting and classification is based on signals of scattered light and fluorescence to determine the characteristics of the particles. Atypical cells show side fluorescence and scattered light properties indicating their enlarged nuclei and increased nucleus/cytoplasm ratio. A laboratory may prefer using combinations of UC-3500 and

UF-4000/5000 where manual microscopy should be used to edit results when needed. Sysmex UN offers an alternative module, UD-10, to be used for investigation of requested samples. The modular system can be ordered to define samples to be treated by UD-10, so that the whole process is still fully automated. UD 10 presents images captured by an internal camera. The captured images may be presented as 40 or 80 (on choice) high power field images per sample or single particle images in which particles can be classified into eight different classes based on their size (Figure 1).



**Figure 1:** UD-10 presents 40 high power field images of the specimen. A single atypical cell in A and a small group of atypical cells in B are seen with white and red blood cells on the background. Besides, the instrument presents frames of particles classified according to their sizes. In C two atypical cells are seen.

Modular units allow laboratories to compose original units depending on their own needs. In the case of Sysmex UN, a laboratory may prefer to use any of the three units separately or make a full combination. Actually, a combination of UC unit and UF unit is sufficient for a full report of urinalysis including chemical and sediment parameters. UD 10 unit is an option to replace manual microscopy. Currently, manual microscopy is still needed besides any automated urine analyzer to check problematic samples. UD 10 promises digital images taken spontaneously as a part of modular work-flow. Obviously, it is a matter of choice to use manual microscopy or an automated analyzer, but in evaluating atypical cells parameter in Sysmex UN, I believe in the superiority of UD 10 unit. The images are enough in number and quality and most importantly, automatic flow of samples save time which avoids unwanted degenerative changes due to time delay between the analyzer and manual microscopy. "Atypical cells" parameter in Sysmex UN is expected to serve a screening test for malignant proliferations of the urinary tract [3]. Evaluation of on-board images will strengthen the efficiency of the automated urine analyzer [4].

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