# Evaluation of a new automated cell analyzer (Sysmex UF-1000i) for bacteriological screening of urine

**Shanti Levi[1], Paolo Piazzai[2], Orietta Illiberi[2], Erika Coppo[1], Ramona Barbieri[1], Eugenio A. Debbia[1], Anna Marchese[1]**

*1 Sezione di Microbiologia, DISC, Università degli Studi di Genova, Genova*

*2 Ospedale Evangelico Internazionale, Genova*

**Key words:** UF-1000, Urine screening, Fast evaluation of positive samples

## SUMMARY

**Introduction**. Sysmex UF-1000 is a new flow cytometry for the analysis of urine based on a laser diode technology using specific compounds for the staining nucleic acids, characterized by a threshold of detection of bacteria equal to 1000 CFU/ml. The purpose of this study was to compare the positivity or negativity of the urine samples using standard procedures and with the response obtained from the instrument UF-1000i.

**Methods**. During the period May and July 2011, 1024 urine samples obtained from the laboratory of the hospital in Genoa-Voltri were analyzed with the instrument Sysmex UF-1000i. The samples were stored at a temperature of 5°C during transport. The instrument after loading of the sample is able to assess the bacterial load in about 1 minute per sample.

**Results**. 1024 samples were analyzed with Sysmex UF-1000 analyzed in parallel by the hospital laboratory in Genoa Voltri. 228 are positive results for Sysmex UF-1000 (bacterial loads in excess of 1000 CFU/ml). The data obtained were consistent with those recorded with traditional analysis. 18 samples were positive only for our instrument, but not with the traditional system used in the laboratory for comparison.

**Conclusion**. The advantage of Sysmex UF-1000 is certainly due to obtain immediate results after the reading of each individual sample that is higher than any other instrument or method of analysis used. The slight discrepancy of the results obtained may be due to the extremely low calibration of UF-1000. This allows in a very short time to discard all negative samples with enormous saving of time and material. For positive samples and applies the criterion of the routine ie, the bacterial load has a meaning according to the type of patient considered, as in the case of pediatric or catheterized patients

## INTRODUCTION

Uncomplicated urinary tract infections (UTIs) are among the most prevalent infectious diseases and affect mainly women. Between one-quarter and one-half of all women experience a UTI during their lifetime (11). Urine samples represent therefore a large proportion of the specimens processed in most clinical laboratories.

The microrganism mainly responsible for these infections is *Escherichia coli*, which accounts for 70-90% of all uropathogens. Occasionally also other *Enterobacteriaceae*, for example *Proteus mirabilis,* and *Klebsiella* spp, are found in urinary samples (9). Among Gram-positive bacteria, enterococci are sometimes isolated from patients with cystitis (4-6).

For several reasons including the time required for the microbiological procedures, costs, infections are seldom diagnosed on an etiologic basis even in hospitals (10). Therefore, the success of the empiric therapy adopted depends, not only, on factors including age, risk factors, the overall conditions of the patient and the severity of the infection, but also, on the ability of the physician to guess the pathogen and its resistance pattern (9, 10, 13). The picture is further compounded by the fact that, owing to strikingly divergent prescribing habits the incidence of antimicrobial resistance in a certain species may vary among different geographic locations (7-8).

To provide microbiological data for the physicians in a timely manner, many molecular biology techniques and automated methods have been developed and introduced (2, 3). A simple and a rapid test, if effective, could, in fact, increased laboratory efficiency, decrease costs, and allows physicians to start prompt therapy.

Urine tests have major clinical significance as they are useful in screening for, and identifying the causes of kidney and urinary diseases. urine samples can be collected non-invasively, and repeated measurements are easy.

***Corresponding author:*** **Shanti Levi**
Sezione di Microbiologia, DISC, Università di Genova,
Largo R. Benzi 10, 16132, Genova
E-mail: **shanti.levi@gmail.com**

In this study we used a fully automated urine particle analyzer Sysmex UF-1000i (Sysmex Corporaton, Kobe, Japan).
This is a new flow cytometry for the analysis of urine based on a laser diode technology by the use of specific compounds for the staining of nucleic acids, characterized by a threshold of detection of bacteria equal to 1000 CFU/ml.
The aim of this study was to compare the positivity or negativity of the urine samples from an external center (Genova Voltri hospital) and analyzed using standard procedures of the laboratory with the response obtained from the instrument UF-1000i.
Diagnosis of urinary tract infection (UTI) is primarily done by microbiologic culture, which is time-consuming and can produce false-positives and false-negatives. Flow cytometry allows for rapid screening of many samples and eliminates culturing (1, 6, 12).

## MATERIALS AND METHODS

In the period between May and July 2011, 1024 urine samples collected and processed in the Clinical Microbiology Laboratory of Genoa-Voltri Hospital, were analyzed with the instrument Sysmex UF-1000i at the Section of Microbiology (DISC) of the University of Genoa. The samples were stored at a temperature of 5°C, after collection and during transport. The urine samples were analyzed within 6 hours after collection. The instrument after loading of the sample is able to assess the bacterial concentration in about 1 minute per sample.

## RESULTS

1024 samples were analyzed with Sysmex UF-1000i and the results were compared with those obtained in the Clinical Microbiology Laboratory of Genoa-Voltri Hospital. 228 were registered as positive results for Sysmex UF-1000i (bacterial loads in excess of 1000 CFU/ml). The data obtained were consistent with those recorded with traditional analysis. 18 samples were positive only for our instrument, but not with the traditional system used in the laboratory for comparison.

## CONCLUSIONS

The advantage of Sysmex UF-1000i is certainly due to the immediate results obtain after the reading of each individual sample that is higher than any other instrument or method of analysis used. The slight discrepancy of the results obtained may be due to the extremely low calibration of UF-1000. This allows in a very short time to discard all negative samples with enormous saving of time and material. For positive samples and applies the criterion of the routine ie, the bacterial load has a meaning according to the type of patient considered, as in the case of catheterized patients or pediatric patients.

**Figure I.** *The UF-1000i instrument.*

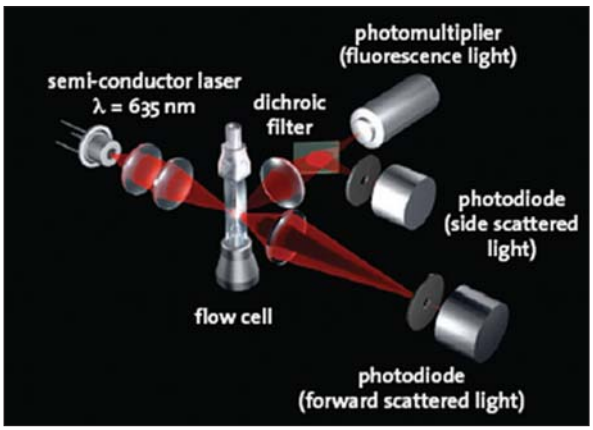


**Figure II.** *The Optical unit of UF-1000i analyzer.*

## REFERENCES

1. Fabbro C, Darolles J, Rault JP. Evaluation of the performances of the UF-1000i(®) automated urine analyzer. *Ann Biol Clin (Paris)*. 2011 Jul-Aug; 69 (4): 431-9.
2. Felmingham D, Brown DFJ. Instrumentation in antimicrobial susceptibility testing. *J Antimicrob Chemother* 2001; 48 (suppl S1): 81-5.
3. Ferraro MJ, Jorgensen JH. Susceptibility testing instrumentation and computerized expert systems for data analysis and interpretation. In Murray PR, Baron EJ, Jorgensen JH, et al.: Manual of Clinical Microbiology, 8th Edition, Washington 2003, 208-217, ASM Press.
4. Grabe M, Bishop MC, Bjerklund-Johansen TE, et al. EAU guidelines for the management of urinary and male genital tract infections. Urinary Tract Infection (UTI) Working Group of the Health Care Office (HCO) of the European Association of Urology (EAU). Arnhem, The Netherlands: EAU; 2006. http://www.uroweb.org [accessed 10 December 2008].
5. Hooton TM, Besser R, Foxman B, Fritsche TR, Nicolle LE. Acute uncomplicated cystitis in an era of increasing antibiotic resistance: a proposed approach to empirical therapy. *Clin Infect Dis* 2004; 39: 75-80.

6. Kadkhoda K, Manickam K, Degagne P, et al. UF-1000i flow cytometry is an effective screening method for urine specimens. *Diagn Microbiol Infect Dis*. 2011 Feb; 69 (2): 130-6.
7. Kahlmeter G. An international survey of the antimicrobial susceptibility of pathogens from uncomplicated urinary tract infections: the ECO.SENS Project. J Antimicrob Chemother 2003; 51: 69-76.
8. Marchese A, Schito GC. Role of global surveillance in combating bacterial resistance. *Drugs* 2001; 61: 167-73.
9. Naber KG, Schito G, Botto H, Palou J, Mazzei T. Surveillance study in Europe and Brazil on clinical aspects and antimicrobial resistance epidemiology in females with cystitis (ARESC): implications for empiric therapy. *Eur Urol* 2008; 54: 1164-78.
10. Raz R, Chazan B, Kennes Y, et al. Empiric use of trimethoprim–sulfamethoxazole (TMP–SMX) in the treatment of women with uncomplicated urinary tract infections, in a geographical area with high prevalence of TMP–SMX-resistant uropathogens. *Clin Infect Dis* 2002; 34: 1165-9.
11. Sobel JD, Kaye D. Urinary tract infections. In: Mandell GL, Douglas RG, and Bennett JE. Principles and Practice of Infectious Diseases. 6th edn Churchill Livingstone 2005; 875-905.
12. Wang J, Zhang Y, Xu D, Shao W, Lu Y. Evaluation of the Sysmex UF-1000i for the diagnosis of urinary tract infection. *Am J Clin Pathol*. 2010 Apr; 133 (4): 577-82.
13. Warren JW, Abrutin E, Hebel JR, et al. Guidelines from antimicrobial treatment of uncomplicated acute bacteal cystitis and acute pyelonephritis in women. *Clin Infect Dis* 1999; 29: 745-58.