External Quality Control Results of Urine Dip-Slide Devices

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Abstract
Urinary tract infections are frequently diagnosed by using urine dip-slide devices, especially in medical practices and small laboratories. We performed a retrospective analysis of more than 3,000 results obtained by several urine dip-slide devices during external quality control surveys. We found that an underestimation of bacterial counts and a difficulty in identifying mixed flora were relatively more frequent in medical practices than in specialised laboratories, and that regular participation in external quality control surveys correlates with better performances.

Introduction
Urinary tract infections (UTI) are common infectious diseases which affect all age groups. Since urine can be readily obtained, its analysis is frequently performed in laboratories, thus accounting for an important workload. As alternatives to traditional cultures performed on blood agar and selective agar plates, many urine dip-slide devices are available and are well adapted to small laboratories such as medical practices. These devices are easy to handle and are therefore widely used, particularly in Swiss medical practices as well as in specialised laboratories.

Methods
The participants regularly received one or two sets of quality control samples accompanied by a data reply sheet. They did not know the content of the samples and had to determine, with the kits they routinely use, the bacterial CFU/ml and whether the culture was pure or mixed. Each control sample set consisted of three vials: the first vial contained lyophilised bacteria (dark particles) in a transparent cap, the second contained the rehydration buffer, and in the third bottle, 99 ml of buffer solution was provided.

The following information was required: the method used (name of the manufacturer and of the kit), the CFU/ml (growth absence, 10^2, 10^3, 10^4, and 10^5 CFU/ml) and the type of culture (pure culture or mixed flora).

Results and discussion
For samples containing ≥10^5 CFU/ml, specialised laboratories obtained, on average, 87.3% of correct answers, 10.8% of underestimated bacterial counts (≤10^1), and 1.9% of growth absence, whereas medical practices obtained, on average, 70.9% of correct answers, 25.7% of underestimated bacterial counts (≤10^1), and 3.5% of growth absence.

For samples containing 10^4 CFU/ml, specialised laboratories obtained on average 71.0% of correct answers, 24.8% of overestimated bacterial counts (≥10^4), and 4.2% of growth absence, whereas the medical practices obtained, on average, 71.4% of correct answers, 12.8% of overestimated bacterial counts (≥10^4), and 15.8% of growth absence.

For samples containing pure cultures, specialised laboratories obtained, on average, 92.0% of correct results whereas medical practices obtained on average 83.7% of correct answers. On average, 9.2% of specialised laboratories did not report the type of culture and this percentage reached 20.5 for medical practices.

For samples containing a mixed flora, specialised laboratories obtained, on average, 82.9% of correct results whereas medical practices obtained on average 65.0% of correct answers. On average, 5.5% of specialised laboratories did not report the type of culture, and this percentage reached 13.1 for medical practices.

Specialised laboratories tended to slightly overestimate the bacterial counts (CFU/ml) whereas medical practices tended to underestimate the quantification. In several cases, the reported insufficient growth was due to the incubation of the dip-slides at room temperature. In other cases, the reading of the dip-slides was performed before 24 h of incubation. Other factors that can lead to errors include the temperature of the incubator that was not carefully controlled (temperatures ≤35°C can reduce the growth of temperature-sensitive species), the reading of the dip-slide with an insufficient light source or after more than 48 h of incubation, the use of an expired dip-slide, the improper storage of the dip-slide, and the presence of condensation water on the agar slide surface.

We found a positive correlation between the number of analyses performed and the number of correct results obtained.

Comparison of performances of specialised laboratories and medical practices in determining bacterial counts

Conclusions
Although urine dip-slide devices are easy to handle and widely used, the results presented here strongly suggest that users should have a solid continuous education in microbiology in order to manipulate the devices correctly and to interpret the results accurately to contribute to optimal patient care. Otherwise, the risk of underestimation of the bacterial count and the difficulty in identifying potential contamination was shown not to be negligible.