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## Evaluation of BIOMIC digital plate reader to determine disc diffusion susceptibilities in a clinical laboratory

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**Background:** The BIOMIC® V3 System is a digital plate reader that reads and interprets disc diffusion susceptibility testing. It is able to automate, standardize endpoints and reduce transcription errors. We sought to compare the accuracy of BIOMIC® results with visually measured zones.

**Material/methods:** BIOMIC® and visually measured zones for 1170 organism-antimicrobial combinations were performed on a total of 85 strains of Gram-positive and Gram-negative organisms that fulfil Clinical and Laboratory Standards Institute (CLSI) guidelines for disc diffusion susceptibility testing.

The organisms tested were isolated from adult patient clinical specimens from Changi General Hospital. All inocula were prepared from pure bacterial cultures and susceptibility tests performed as outlined in CLSI 2016 performance standard.

Three disc diffusion susceptibility plates were prepared for Gram-negative bacteria and one plate was prepared for Gram-positive bacteria. Antibiotics were applied onto the plates using antibiotic dispensers. All zone measurements were recorded after appropriate incubation according to CLSI guidelines.

Zone sizes were measured with a ruler and recorded to the nearest millimeter. These zones were also read by the BIOMIC® image analysis. In accordance with laboratory protocol, zone sizes by the BIOMIC® method were adjusted when the image analysis showed incorrect zone sizes.

Interpretative categories (susceptible, intermediate or resistant) were derived for each zone measured using CLSI 2016 tables. Any discrepancies in interpretative categories and corresponding differences in zone measurements were reviewed by a second reader to confirm both the BIOMIC® and visually measured zones.

The interpretative categories obtained by BIOMIC® were compared with the results of the current method (i.e. visually measured method) and expressed as: agreement, very major errors (false susceptible), major errors (false resistant), and minor errors (susceptible/resistant versus intermediate susceptibility).

**Results:** There were no false-susceptible or false-resistant reads by BIOMIC® compared with visually recorded zone measurements. The interpretative category agreement was 97.6% between the 2 methods. There were a total of 28 minor errors (2.4 %) by the BIOMIC® reader compared with visual reads; resulting in category interpretation changes of intermediate to resistant or susceptible, or *vice versa*. Most of these minor errors (17/28, 61%) were due to reading differences of ≤1mm (see table below). 25% (7/28) of the minor errors occurred with cephalosporin discs and *Klebsiella* species combinations.

| Interpretative category by manual recording | Interpretative category by BIOMIC® recording | No. of recordings with categorical discrepancy | No. of errors due to a measured difference of: | | | Type of error |
|---|---|---|---|---|---|---|
| | | | 1 mm | 2mm | ≥ 3mm | |
| Sensitive | Intermediate | 5/1170 (0.43 %) | 3 | 1 | 1 | Minor error |
| Intermediate | Resistant | 3/1170 (0.26%) | 1 | 2 | 0 | Minor error |
| Intermediate | Sensitive | 13/1170 (1.11%) | 9 | 3 | 1 | Minor error |
| Resistant | Intermediate | 7/ 1170 (0.60%) | 4 | 2 | 1 | Minor error |

**Conclusions:** The BIOMIC® video-assisted plate reader enables rapid reading of zone measurements and has the capability of a visual panel read for manual adjustment of results. BIOMIC® also reduces transcription errors when recording results into LIS (Laboratory Information System). This system provides a useful alternative to manual reading, eliminates user variability but still allows for user control.  We conclude that BIOMIC® is a reliable system for determining interpretative categories from zone diameters of antibiotic disc diffusion test plates.