

## ORIGINAL ARTICLE

# Comparison of the Autof MS1000 with the Vitek MS in the Identification of Bacterial and Yeast Isolates

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## SUMMARY

**Background:** Matrix-assisted laser desorption-ionization-time of flight mass spectrometry (MALDI-TOF) has been widely used in clinical microbiology laboratories as a rapid and reliable tool for pathogen identification. The aim of this study was to evaluate the diagnostic performance of the newly-developed Autof MS1000 in comparison with the Vitek MS.

**Methods:** A total of 578 clinical isolates consisting of 136 Enterobacterales, 76 non-fermenting Gram-negative bacilli, 17 other Gram-negative bacilli, 240 Gram-positive cocci, 30 Gram-positive bacilli, 52 anaerobic bacteria, and 27 yeasts were tested simultaneously by the two systems. The direct smear method was performed for bacteria and the formic acid extraction method for yeasts. Discrepant results were confirmed by 16S rRNA or ITS region sequencing.

**Results:** The Autof MS1000 and Vitek MS identified 93.3% and 95.5% of the strains at the species level, respectively. Three isolates (0.3%) yielded “no identification” results with Vitek MS, and no “unreliable” results (0%) were obtained with Autof MS1000. The Autof MS1000 and Vitek MS misidentified 1.5% and 1.4% of the isolates, respectively. Overall, there was significant agreement between the two systems ( $p < 0.001$ ). In terms of identification times, the Autof MS1000 was approximately three times faster than the Vitek MS.

**Conclusions:** Our results demonstrate that the Autof MS1000 provides comparable results to the Vitek MS and can be used for the rapid identification of microorganisms. Furthermore, this study highlights the need for any MALDI-TOF MS system to implement regular database expansion for the identification of rarely encountered microorganisms.

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## Supplementary Data

Table S1. Detailed identification results of all isolates on the Autof MS1000 and Vitek MS.

| Group of microorganisms                           | n                 | Autof MS1000      |                 |                 | Mis ID          | Vitek MS          |                  |                 | Mis ID          |
|---------------------------------------------------|-------------------|-------------------|-----------------|-----------------|-----------------|-------------------|------------------|-----------------|-----------------|
|                                                   |                   | Species ID        | Genus ID        | No ID           |                 | Species ID        | Genus ID         | No ID           |                 |
| <b><u>Enterobacterales</u></b>                    | <b><u>136</u></b> | <b><u>122</u></b> | <b><u>8</u></b> | <b><u>0</u></b> | <b><u>6</u></b> | <b><u>116</u></b> | <b><u>13</u></b> | <b><u>1</u></b> | <b><u>6</u></b> |
| <i>Citrobacter freundii</i>                       | 1                 | 1                 | 0               | 0               | 0               | 0                 | 1                | 0               | 0               |
| <i>Citrobacter koseri</i>                         | 1                 | 1                 | 0               | 0               | 0               | 1                 | 0                | 0               | 0               |
| <i>Cronobacter sakazakii</i>                      | 1                 | 1                 | 0               | 0               | 0               | 0                 | 0                | 1               | 0               |
| <i>Enterobacter cloacae</i>                       | 7                 | 6                 | 1               | 0               | 0               | 2                 | 5                | 0               | 0               |
| <i>Escherichia coli</i>                           | 54                | 54                | 0               | 0               | 0               | 54                | 0                | 0               | 0               |
| <i>Klebsiella aerogenes</i>                       | 4                 | 4                 | 0               | 0               | 0               | 4                 | 0                | 0               | 0               |
| <i>Klebsiella pneumoniae</i>                      | 30                | 30                | 0               | 0               | 0               | 30                | 0                | 0               | 0               |
| <i>Morganella morganii</i>                        | 7                 | 7                 | 0               | 0               | 0               | 7                 | 0                | 0               | 0               |
| <i>Proteus mirabilis</i>                          | 6                 | 6                 | 0               | 0               | 0               | 6                 | 0                | 0               | 0               |
| <i>Plesiomonas shigelloides</i>                   | 1                 | 1                 | 0               | 0               | 0               | 1                 | 0                | 0               | 0               |
| <i>Providencia rettgeri</i>                       | 2                 | 2                 | 0               | 0               | 0               | 2                 | 0                | 0               | 0               |
| <i>Providencia stuartii</i>                       | 1                 | 1                 | 0               | 0               | 0               | 1                 | 0                | 0               | 0               |
| <i>Raoultella ornithinolytica</i>                 | 2                 | 2                 | 0               | 0               | 0               | 2                 | 0                | 0               | 0               |
| <i>Salmonella ser. Enteritidis</i>                | 7                 | 0                 | 7               | 0               | 0               | 0                 | 7                | 0               | 0               |
| <i>Serratia liquefaciens</i>                      | 1                 | 1                 | 0               | 0               | 0               | 1                 | 0                | 0               | 0               |
| <i>Serratia marcescens</i>                        | 4                 | 4                 | 0               | 0               | 0               | 4                 | 0                | 0               | 0               |
| <i>Shigella sonnei</i>                            | 4                 | 0                 | 0               | 0               | 4               | 0                 | 0                | 0               | 4               |
| <i>Shigella flexneri</i>                          | 2                 | 0                 | 0               | 0               | 2               | 0                 | 0                | 0               | 2               |
| <i>Vibrio parahaemolyticus</i>                    | 1                 | 1                 | 0               | 0               | 0               | 1                 | 0                | 0               | 0               |
| <b><u>Nonfermenting Gram-negative bacilli</u></b> | <b><u>76</u></b>  | <b><u>74</u></b>  | <b><u>1</u></b> | <b><u>1</u></b> | <b><u>0</u></b> | <b><u>75</u></b>  | <b><u>0</u></b>  | <b><u>0</u></b> | <b><u>1</u></b> |
| <i>Acinetobacter baumannii</i>                    | 34                | 33                | 1               | 0               | 0               | 34                | 0                | 0               | 0               |
| <i>Acinetobacter baylyi</i>                       | 1                 | 0                 | 0               | 0               | 1               | 0                 | 0                | 0               | 1               |
| <i>Alcaligenes faecalis</i>                       | 5                 | 5                 | 0               | 0               | 0               | 5                 | 0                | 0               | 0               |
| <i>Burkholderia cepacia</i>                       | 1                 | 1                 | 0               | 0               | 0               | 1                 | 0                | 0               | 0               |
| <i>Delftia acidovorans</i>                        | 1                 | 1                 | 0               | 0               | 0               | 1                 | 0                | 0               | 0               |
| <i>Pseudomonas aeruginosa</i>                     | 29                | 29                | 0               | 0               | 0               | 29                | 0                | 0               | 0               |
| <i>Pseudomonas stutzeri</i>                       | 1                 | 1                 | 0               | 0               | 0               | 1                 | 0                | 0               | 0               |
| <i>Stenotrophomonas maltophilia</i>               | 4                 | 4                 | 0               | 0               | 0               | 4                 | 0                | 0               | 0               |
| <b><u>Other Gram-negative bacilli</u></b>         | <b><u>17</u></b>  | <b><u>16</u></b>  | <b><u>0</u></b> | <b><u>0</u></b> | <b><u>1</u></b> | <b><u>17</u></b>  | <b><u>0</u></b>  | <b><u>0</u></b> | <b><u>0</u></b> |
| <i>Aeromonas punctata</i>                         | 4                 | 4                 | 0               | 0               | 0               | 4                 | 0                | 0               | 0               |
| <i>Aeromonas hydrophila</i>                       | 1                 | 1                 | 0               | 0               | 0               | 1                 | 0                | 0               | 0               |
| <i>Aeromonas sobria</i>                           | 2                 | 2                 | 0               | 0               | 0               | 2                 | 0                | 0               | 0               |
| <i>Haemophilus haemolyticus</i>                   | 3                 | 3                 | 0               | 0               | 0               | 3                 | 0                | 0               | 0               |
| <i>Haemophilus influenzae</i>                     | 5                 | 5                 | 0               | 0               | 0               | 5                 | 0                | 0               | 0               |
| <i>Neisseria subflava</i>                         | 1                 | 1                 | 0               | 0               | 0               | 1                 | 0                | 0               | 0               |
| <i>Neisseria mucosa</i>                           | 1                 | 0                 | 0               | 0               | 1               | 1                 | 0                | 0               | 0               |
| <b><u>Gram-positive cocci</u></b>                 | <b><u>240</u></b> | <b><u>232</u></b> | <b><u>7</u></b> | <b><u>0</u></b> | <b><u>1</u></b> | <b><u>239</u></b> | <b><u>0</u></b>  | <b><u>0</u></b> | <b><u>1</u></b> |
| <i>Enterococcus casseliflavus</i>                 | 4                 | 3                 | 1               | 0               | 0               | 4                 | 0                | 0               | 0               |
| <i>Enterococcus faecalis</i>                      | 28                | 26                | 2               | 0               | 0               | 28                | 0                | 0               | 0               |

Table S1. Detailed identification results of all isolates on the Autof MS1000 and Vitek MS (continued).

| Group of microorganisms             | n                | Autof MS1000     |                  |                 | Mis ID          | Vitek MS         |                 |                 | Mis ID          |
|-------------------------------------|------------------|------------------|------------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|
|                                     |                  | Species ID       | Genus ID         | No ID           |                 | Species ID       | Genus ID        | No ID           |                 |
| <i>Enterococcus faecium</i>         | 18               | 17               | 1                | 0               | 0               | 18               | 0               | 0               | 0               |
| <i>Enterococcus gallinarum</i>      | 25               | 25               | 0                | 0               | 0               | 25               | 0               | 0               | 0               |
| <i>Micrococcus luteus</i>           | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Pediococcus acidilactici</i>     | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Staphylococcus aureus</i>        | 39               | 37               | 2                | 0               | 0               | 39               | 0               | 0               | 0               |
| <i>Staphylococcus capitis</i>       | 2                | 2                | 0                | 0               | 0               | 2                | 0               | 0               | 0               |
| <i>Staphylococcus caprae</i>        | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Staphylococcus epidermidis</i>   | 26               | 25               | 1                | 0               | 0               | 26               | 0               | 0               | 0               |
| <i>Staphylococcus haemolyticus</i>  | 10               | 10               | 0                | 0               | 0               | 10               | 0               | 0               | 0               |
| <i>Staphylococcus hominis</i>       | 10               | 10               | 0                | 0               | 0               | 10               | 0               | 0               | 0               |
| <i>Staphylococcus lugdunensis</i>   | 2                | 2                | 0                | 0               | 0               | 2                | 0               | 0               | 0               |
| <i>Staphylococcus saprophyticus</i> | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Streptococcus agalactiae</i>     | 25               | 25               | 0                | 0               | 0               | 25               | 0               | 0               | 0               |
| <i>Streptococcus anginosus</i>      | 6                | 6                | 0                | 0               | 0               | 6                | 0               | 0               | 0               |
| <i>Streptococcus dysgalactiae</i>   | 3                | 3                | 0                | 0               | 0               | 3                | 0               | 0               | 0               |
| <i>Streptococcus mitis/oralis</i>   | 17               | 16               | 0                | 0               | 1               | 17               | 0               | 0               | 0               |
| <i>Streptococcus parasanguinis</i>  | 2                | 2                | 0                | 0               | 0               | 2                | 0               | 0               | 0               |
| <i>Streptococcus pneumoniae</i>     | 3                | 3                | 0                | 0               | 0               | 2                | 0               | 0               | 1               |
| <i>Streptococcus pyogenes</i>       | 12               | 12               | 0                | 0               | 0               | 12               | 0               | 0               | 0               |
| <i>Streptococcus salivarius</i>     | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Streptococcus sanguinis</i>      | 3                | 3                | 0                | 0               | 0               | 3                | 0               | 0               | 0               |
| <b><u>Gram-positive bacilli</u></b> | <b><u>30</u></b> | <b><u>27</u></b> | <b><u>3</u></b>  | <b><u>0</u></b> | <b><u>0</u></b> | <b><u>29</u></b> | <b><u>1</u></b> | <b><u>0</u></b> | <b><u>0</u></b> |
| <i>Bacillus cereus</i> group        | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Bacillus pumilus</i>             | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Corynebacterium amycolatum</i>   | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Corynebacterium striatum</i>     | 21               | 19               | 2                | 0               | 0               | 20               | 1               | 0               | 0               |
| <i>Dermobacter hominis</i>          | 1                | 0                | 1                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Lactobacillus crispatus</i>      | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Lactobacillus gasseri</i>        | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Lactobacillus iners</i>          | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Lactobacillus lactis</i>         | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Listeria monocytogenes</i>       | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |
| <b><u>Anaerobic bacteria</u></b>    | <b><u>52</u></b> | <b><u>41</u></b> | <b><u>11</u></b> | <b><u>0</u></b> | <b><u>0</u></b> | <b><u>51</u></b> | <b><u>0</u></b> | <b><u>1</u></b> | <b><u>0</u></b> |
| <i>Bacteroides thetaiotaomicron</i> | 2                | 2                | 0                | 0               | 0               | 2                | 0               | 0               | 0               |
| <i>Bacteroides fragilis</i>         | 11               | 11               | 0                | 0               | 0               | 11               | 0               | 0               | 0               |
| <i>Bacteroides nordii</i>           | 1                | 1                | 0                | 0               | 0               | 0                | 0               | 1               | 0               |
| <i>Clostridioides difficile</i>     | 3                | 2                | 1                | 0               | 0               | 3                | 0               | 0               | 0               |
| <i>Clostridioides sporogenes</i>    | 1                | 0                | 1                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Cutibacterium acnes</i>          | 5                | 4                | 1                | 0               | 0               | 5                | 0               | 0               | 0               |
| <i>Cutibacterium avidum</i>         | 2                | 2                | 0                | 0               | 0               | 2                | 0               | 0               | 0               |
| <i>Eggerthella lenta</i>            | 1                | 0                | 1                | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Finegoldia magna</i>             | 5                | 5                | 0                | 0               | 0               | 5                | 0               | 0               | 0               |
| <i>Fusobacterium necrophorum</i>    | 1                | 1                | 0                | 0               | 0               | 1                | 0               | 0               | 0               |

Table S1. Detailed identification results of all isolates on the Autof MS1000 and Vitek MS (continued).

| Group of microorganisms              | n                | Autof MS1000     |                 |                 | Mis ID          | Vitek MS         |                 |                 | Mis ID          |
|--------------------------------------|------------------|------------------|-----------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|
|                                      |                  | Species ID       | Genus ID        | No ID           |                 | Species ID       | Genus ID        | No ID           |                 |
| <i>Parabacteroides distasonis</i>    | 1                | 1                | 0               | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Parvimonas micra</i>              | 5                | 2                | 3               | 0               | 0               | 5                | 0               | 0               | 0               |
| <i>Peptostreptococcus anaerobius</i> | 6                | 6                | 0               | 0               | 0               | 6                | 0               | 0               | 0               |
| <i>Porphyromonas gingivalis</i>      | 1                | 0                | 1               | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Prevotella bivia</i>              | 1                | 0                | 1               | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Prevotella denticola</i>          | 1                | 1                | 0               | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Prevotella melaninogenica</i>     | 1                | 1                | 0               | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Prevotella nigrescens</i>         | 1                | 0                | 1               | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Prevotella oris</i>               | 1                | 1                | 0               | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Prevotella timonensis</i>         | 2                | 1                | 1               | 0               | 0               | 2                | 0               | 0               | 0               |
| <b><u>Yeasts</u></b>                 | <b><u>27</u></b> | <b><u>27</u></b> | <b><u>0</u></b> | <b><u>0</u></b> | <b><u>0</u></b> | <b><u>26</u></b> | <b><u>0</u></b> | <b><u>1</u></b> | <b><u>0</u></b> |
| <i>Candida albicans</i>              | 10               | 10               | 0               | 0               | 0               | 10               | 0               | 0               | 0               |
| <i>Candida auris</i>                 | 5                | 5                | 0               | 0               | 0               | 5                | 0               | 0               | 0               |
| <i>Candida glabrata</i>              | 7                | 7                | 0               | 0               | 0               | 7                | 0               | 0               | 0               |
| <i>Candida parapsilosis</i>          | 1                | 1                | 0               | 0               | 0               | 1                | 0               | 0               | 0               |
| <i>Candida tropicalis</i>            | 3                | 3                | 0               | 0               | 0               | 3                | 0               | 0               | 0               |
| <i>Cyberlindrea fabianni</i>         | 1                | 1                | 0               | 0               | 0               | 0                | 0               | 1               | 0               |