(Heston) for their support and help during set up and validation; Dr David Daniels and staff at the GUM, WMUH for collecting the oral fluid from HIV patients; Hannah de Gruchy and staff at Dr Thom (UK-based online doctor service) who sent patient samples to Quest Diagnostics; and Dr Ing-Wei Khor-Ferrer (Nicholls Institute, Quest Diagnostics) for her invaluable advice and help in preparing this manuscript.

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Misidentification of *Providencia stuartii* as *Serratia fonticola* by Vitek 2

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A 58-year-old male patient suffering from hypertension and receiving angiotensin-converting enzyme inhibitor (ACEI) submitted a midstream urine sample for culture. A non-lactose fermenter (NLF) exceeding 10^5 colony-forming units (cfu)/mL grew on cysteine lactose electrolyte deficient (CLED) agar. It grew as diffuse brown colonies (presence of tryptophan deaminase) on UriSelect 4 medium (Bio-Rad Laboratories). It was also positive for indole production, lysine deamination, and oxidation-fermentation test, but negative for hydrogen sulphide production, motility, ornithine decarboxylation, and lysine decarboxylation. The presumptive identification of this NLF was *Providencia* species. The Vitek 2 Gram-negative (GN) identification card (bioMérieux) was used to identify the NLF. Surprisingly, the Vitek 2 system identified this NLF as *Serratia fonticola* with an excellent confidence level (99% probability). The same result was obtained when the GN card was repeated.

To resolve the discrepancy, the NLF was identified using the API 20E system (bioMérieux) and the Vitek MS system (bioMérieux). Both methods confirmed this NLF as *Providencia stuartii* rather than *S. fonticola*. Confidence levels of the API 20E and the Vitek MS were 97.5% and 99.9% probability, respectively.

In the GN card, only three biochemical test results (i.e., adonitol fermentation, Ellman reaction and urease activity) varied between the current *P. stuartii* strain and previously identified *P. stuartii* strains. Unlike the variable Ellman and urease results among *P. stuartii* strains, the adonitol fermentation is usually negative for *P. stuartii* strains. It was demonstrated that 5% of *P. stuartii* is positive for the adonitol fermentation, whereas 100% of *S. fonticola* is positive for the adonitol fermentation.[1] The infrequent positive result for adonitol fermentation may mislead the GN card to misidentify *P. stuartii* as *S. fonticola*, as in this case.

Although the number of biochemical tests in the API 20E is less than that in the GN card, the API 20E includes key tests that are absent from the GN card, but which are capable of discriminating *P. stuartii* and *S. fonticola* (e.g., fermentation of arabinose, melibiose and rhamnose). It was shown that for *P. stuartii* and *S. fonticola* positive rates were 1% and 100%,

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respectively, for arabinose fermentation; 0% and 98%, respectively, for melibiose fermentation; and 0% and 76%, respectively, for rhamnose fermentation.[1] These tests may help API 20E arrive at a more accurate identification.

In contrast to the GN card and the API 20E, which identify bacteria based on their biochemical reactions, the Vitek MS uses matrix-assisted laser desorption/ionization-time of flight (MALDI-TOF) mass spectrometry to analyse the mass-to-charge ratio of 16S ribosomal proteins. The problem of uncommon biochemical phenotypes is therefore unlikely to affect identification by Vitek MS.

Although misidentification by the Vitek 2 system has been reported,[2–4] misidentification of *P. stuartii* as *S. fonticola* by the Vitek 2 has not been documented previously.[5–7] To improve the identification of *P. stuartii* and *S. fonticola*, the manufacturer may consider refining the biochemical test panel of its GN card in a later version. A relatively low confidence level (e.g., <90% probability) may alarm users and they should interpret identification with caution, especially when only a single identification platform is used.

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