API Computer Profiles: Correlation of API 20E with API 10S

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Received for publication 6 June 1977

A comparison of identifications of 201 clinical isolates with the 21-test API 20 Enteric kit and the subset of tests in API 10S indicated 85.6% agreement at the species level and 93.5% agreement at the genus level.

Several multitest media kits can be used for biochemical characterization of the *Enterobacteriaceae* (2, 4, 5, 8-10). However, it has been recently recommended that whichever system is used, the capability for identifying gram-negative organisms should be maintained with 95% accuracy, at least to the genus level (3). During a recent study, using the API 20E (Analytab Products Inc., Plainview, N.Y.), the feasibility of the 10S kit as a routine screening kit for organisms from certain specimens (e.g., dietary stools) and/or for a less expensive identification system was determined.

Since the API 10S is simply an abbreviated version of the API 20E, the reactions obtained with the larger kit were applied to those biochemical indexes involved in the API 10S, namely, beta-galactosidase, glucose, arabinose, lysine decarboxylase, ornithine decarboxylase, citrate, hydrogen sulfide, urease, tryptophane deaminase, indole, and oxidase.

Clinical isolates used were representative of the distribution of organisms found in this laboratory. Isolates included: 35 *Escherichiae*, including 1 *Shigella*; 20 *Salmonellae*, comprised of 7 *Salmonella*, 1 *Arizona*, 9 *Citrobacter freundii*, and 3 *Citrobacter diversus*; 76 *Klebsiellae*, including 31 *Klebsiella*, 14 *Serratia*, and 31 *Enterobacter*; and 68 *Proteae*, of which 56 were *Proteus* and 12 were *Providencia*. An *Edwardsiella* and a *Yersinia* were also included (Table 1).

Individual colonies were picked from a MacConkey plate; the method of inoculation and interpretation of results was carried out according to the manufacturer's directions. By analyzing coded triads of reactions within the 21-test system, a profile number was determined which could be referred to in the *API Analytical Profile Index*. Identifications of *Enterobacteriaceae* were made to species level.

All ambiguities in results for the API 20E were corrected, using either serogrouping, reconfirmation of initial results, and/or observation of

colony morphology. At this point results for the API 20E were unambiguous.

The manufacturer does not provide a Profile Register for the API 10S; however, an *Interpretive Pattern Directory (IPD)* was recently developed at the National Institutes of Health (7). The data base used for the API 20 Profile Register determined the basis for the *IPD*; in addition, a frequency of occurrence was assigned for each pattern listed in the Profile Register. Clinical isolates were not processed through the API 10S kit to prepare this directory. Further, Robertson and MacLowry (7) used the records of API 20E test results to determine the theoretical percent accuracy of the API 10S. They obtained correlations of 96.9% at the genus level and 95.9% at the species level by using a technique of best judgment (choosing the organism with the greatest frequency of occurrence) to clarify ambiguities in the API 10S profile.

In the present study, an extension of the best judgment technique was applied to resolve ambiguities in the system as the clinical isolates were available for further analysis. This involved selecting the organism with the greatest frequency of occurrence as well as serogrouping and observing macroscopic morphology.

As can be seen from Table 2, before applying the best judgment technique to the results obtained for the API 10S, the agreement with the API 20E was 57.7% at the genus level and 46.8% at the species level. After using the best judgment technique in the *IPD* ambiguous profiles, the percentages increased to 93.5% at the genus level and 85.6% at the species level (Table 1).

Of the 201 profiles encountered in the 20E system, four reduced to an API 10S pattern that was not described in the *IPD*. After applying the best judgment technique, nine isolates disagreed at the genus level. Six of these isolates were, in particular, *Serratia liquefaciens* in the API 20E, and either *Enterobacter aerogenes* or *Enterobacter cloacae* in the API 10S. Sixteen isolates were in agreement to the genus, but not

TABLE 1. Correlation of API 20E and API 10S systems

API 20E identification	No. of isolates	Correct agreements ^a	
		No.	%
<i>Escherichia coli</i>	34	34	100
<i>Shigella sonnei</i>	1	1	100
<i>Salmonella</i>	7	7	100
<i>Arizona</i>	1	0	0
<i>Citrobacter freundii</i>	9	8	88.9
<i>C. diversus</i>	3	3	100
<i>Klebsiella pneumoniae</i>	30	30	100
<i>K. ozaenae</i>	1	0	0
<i>Serratia marcescens</i>	8	7	87.5
<i>S. liquefaciens</i>	6	0	0
<i>Enterobacter aerogenes</i>	8	7	87.5
<i>E. cloacae</i>	15	15	100
<i>E. hafniae</i>	5	5	100
<i>E. agglomerans</i>	3	3	100
<i>Proteus mirabilis</i>	28	28	100
<i>P. vulgaris</i>	5	3	60.0
<i>P. rettgeri</i>	12	7	58.3
<i>P. morganii</i>	11	8	72.7
<i>Providencia</i>	12	5	41.7
<i>Edwardsiella</i>	1	1	100
<i>Yersinia enterocolitica</i>	1	0	0
Totals	201	172	85.6

^a After application of best judgment technique.

TABLE 2. Agreement between API 20E and API 10S for 201 isolates

Agreement	Before BJT ^a		After BJT	
	No.	%	No.	%
Genus level	116	57.7	188	93.5
Species level	94	46.8	172	85.6

^a Best judgment technique.

the species level. Nine of these species were not listed in the IPD choices. Seven of the unlisted species proved to be *Providencia stuartii* in the API 20E and were described as *P. alcalifaciens* in the API 10S. Two were identified as *Proteus rettgeri* in the API 20E and as other *Proteus* species in the API 10S.

Although it would seem that the predictive accuracy of any identification system would depend upon testing more than one isolate of a particular species, it should be noted that the test isolates are representative of the distribution of organisms encountered in this laboratory and that these frequencies have been calculated based upon more than 3,000 isolates of *Enterobacteriaceae*. Any testing of 5 to 10 strains of a

species which has less than a 1% frequency (actually less than 0.1% in our experience) would tend to skew the data when a total of 200 isolates are surveyed. For example, in this study the one isolate of *Yersinia* was not identified correctly. If 10 strains were studied (a 5% frequency distribution), then the overall accuracy of the system would have been distorted. Further, the use of frequency distribution is in accord with the procedures used for computer-assisted identifications, as the matrixes of information (truth tables) for establishing the computer profiles are based upon the retrospective probability of occurrence of each isolate (1).

The API 20E has been evaluated as having an overall accuracy of identification of 94 to 96.4% (6, 10). The API 10S seems fairly reliable, having an accuracy of 93.5%, at least to the genus level when minimum additional effort (i.e., observation of colonial morphology and serogrouping) is applied. The kit could be used as an effective, relatively inexpensive system for identifying *Enterobacteriaceae*.

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