AN OUTLINE OF NOMENCLATURE FOR
THE FAMILY ENTEROBACTERIACEAE¹

W.H. Ewing

Communicable Disease Center,
Public Health Service, U.S. Department
of Health, Education, and Welfare,
Atlanta, Georgia

SUMMARY. A nomenclatural system for the family Enterobacteriaceae, including four tribes and ten genera, is presented in outline form as follows:

Tribe I. Escherichieae Bergey, Breed and Murray. Genera: Escherichia Castellani and Chalmers (Type sp.: E. coli (Migula) Castellani and Chalmers); Shigella Castellani and Chalmers (Type sp.: S. dysenteriae (Shiga) Castellani and Chalmers).

Tribe II. Salmonelleae Bergey, Breed and Murray. Genera: Salmonella Lignières (Type sp.: S. cholerae-suis (Smith) Weldin); Arizona Kauffmann and Edwards (Type sp.: A. arizonae Kauffmann and Edwards); Citrobacter Werkman and Gillen (Type sp.: C. freundii (Braak) Werkman and Gillen).

Tribe III. Klebsielleae Trevisan. Genera: Klebsiella Trevisan (Type sp.: K. pneumoniae (Schroeter) Trevisan); Aerobacter Beijerinck (Type sp.: A. aerogenes (Kruse) Beijerinck); Serratia Bizio (Type sp.: S. marcescens Bizio).

Tribe IV. Proteeae Castellani and Chalmers. Genera: Proteus Hauser (Type sp.: Proteus vulgaris Hauser); Providencia Kauffmann and Edwards (Type sp.: P. alcalifaciens (De Salles Gomes) Ewing).

Certain proposals regarding the system are made for consideration by the Judicial Commission of the International Committee on Bacteriological Nomenclature, as well as of all others who may be interested. The system is proposed for use by investigators in

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all fields of bacteriology when dealing with members of this family.

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The purpose of this paper is to present in outline a system of nomenclature for the family Enterobacteriaceae. The outline follows the taxonomic system previously reported by Ewing and Edwards (I.B.² 10:1, 1960) with respect to the various levels of classification. This taxonomic system found rather wide acceptance and since it was published in 1960, many have suggested that the author translate it into a system of formal nomenclature that could be used by the authors of textbooks, journal editors, and by anyone else who might have need of such a system. The author has acquiesced to these suggestions and the outline of nomenclature to be presented is the result.

It is not our purpose to attempt to review the voluminous literature on the subjects of nomenclature and of taxonomy within the family Enterobacteriaceae. Instead, only those works that are thought to be pertinent to the present discussion, or which are considered important sources of information, are quoted. References to papers of ordinary length are inserted in the text, while references to longer papers, monographs, and books, as well as to several publications not cited in the text, are listed at the end. Those interested in reading further on these subjects should consult a file of the International Bulletin of Bacteriological Nomenclature and Taxonomy, as well.

The outline is presented in its simplest form and this is followed by a series of annotations, in which pertinent facts are mentioned, and in which attention is directed to points that should be acted upon by the Judicial Commission of the Nomenclature Committee of the International Association of Microbiological Societies. References are omitted from the outline but may be found in Bergey's Manual, 6th and 7th editions. Finally, there is a brief discussion.

² I.B. = International Bulletin of Bacteriological Nomenclature and Taxonomy, Iowa State University Press, Ames, Iowa, U.S.A.

Code = International Code of Nomenclature of Bacteria and Viruses. 1958, Iowa State University Press, Ames, Iowa, U.S.A.

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The Nomenclature in Outline

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Family X ENTEROBACTERIACEAE Rahn	1
Tribe I ESCHERICHIEAE Bergey, Breed, and Murray	2
Genus I <u>Escherichia</u> Castellani and Chalmers	2
1. <u>Escherichia coli</u> (Migula) Castellani and Chalmers	3
Genus II <u>Shigella</u> Castellani and Chalmers	4
1. <u>Shigella dysenteriae</u> (Shiga) Castellani and Chalmers	
2. <u>Shigella flexneri</u> Castellani and Chalmers	
3. <u>Shigella boydii</u> Ewing	
4. <u>Shigella sonnei</u> (Levine) Weldin	
Tribe II SALMONELLEAE Bergey, Breed, and Murray	
Genus I <u>Salmonella</u> Lignières	5
1. <u>Salmonella cholerae-suis</u> (Smith) Weldin	6
2. <u>Salmonella typhi</u> (Schroeter) Warren and Scott	7
3. <u>Salmonella enteritidis</u> (Gaertner) Castellani and Chalmers	8
Genus II <u>Arizona</u> Kauffmann and Edwards	9
1. <u>Arizona arizonae</u> Kauffmann and Edwards	
Genus III <u>Citrobacter</u> Werkman and Gillen	
1. <u>Citrobacter freundii</u> (Braak) Werkman and Gillen	10
Tribe III KLEBSIELLEAE Trevisan	11
Genus I <u>Klebsiella</u> Trevisan	11
1. <u>Klebsiella pneumoniae</u> (Schroeter) Trevisan	12
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3. <u>Klebsiella rhinoschleromatis</u> Trevisan	
Genus II <u>Aerobacter</u> Beijerinck	
1. <u>Aerobacter aerogenes</u> (Kruse) Beijerinck	13
1a. <u>Aerobacter aerogenes</u> subspecies <u>hafniae</u> (Moeller) Ewing comb. nov.	14
2. <u>Aerobacter cloacae</u> (Jordan) Bergey, Breed, and Murray	
3. <u>Aerobacter liquefaciens</u> (Beijerinck) Grimes and Hennerty	15

Genus III Serratia Bizio 16

1. Serratia marcescens Bizio
 - 1a. Serratia marcescens subspecies kiliensis
(Lehmann and Neumann) Ewing, Davis
and Reavis

Tribe IV PROTEEEAE Castellani and Chalmers 17

Genus I Proteus Hauser

1. Proteus vulgaris Hauser
2. Proteus mirabilis Hauser
3. Proteus morganii (Winslow et al.) Rauss
4. Proteus rettgeri (Hadley et al.) Rustigian
and Stuart

Genus II Providencia Kauffmann and Edwards

1. Providencia alcalifaciens (De Salles Gomes)
Ewing comb. nov.
2. Providencia stuartii (Buttiaux et al.) Ewing
comb. nov.

N.B. The first species listed in each genus is the type species.

Annotations

1. The family name Enterobacteriaceae Rahn was conserved (I.B. 8:73, 1958; Code, 165).

2. The name of Tribe I, Escherichieae Bergey, Breed, and Murray, is the logical name, since the genus Escherichia was designated the type genus of the family (I.B. 8:73, 1958; Code, 166; Rules 3 and 4, Code, 22, 24).

3. Escherichia coli (Migula) Castellani and Chalmers was designated the type species of the genus (I.B. 8:73, 1958; Code, 166). The specific epithet coli in the species name Escherichia coli (Migula) Castellani and Chalmers should be designated as a conserved specific epithet (epitheton specificum conservandum) for the species named Bacterium coli commune Escherich 1885. It should be conserved against the specific epithet escherichii of the senior (objective) synonym Bacillus escherichii Trevisan 1889.

An Opinion is requested from the Judicial Commission of the International Committee on Bacteriological Nomenclature.

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4. The nomenclature (and taxonomy) of genus II, Tribe I, the genus Shigella, has been acted upon, accepted, and conserved (I.B. 1:147, 1951; 3:82, 1953; 3:150, 1953; 4:148, 1954; 8:195, 1958; 10:85, 1960; Code, 167).

5. Investigation has shown that although Lignières proposed the generic name Salmonella, he gave no specific name to the "type le microbe du hog cholera de Salmon." The first use of Salmonella in a legitimate combination was by Buchanan (J. Bacteriol. 3:53, 1918) who listed Salmonella as a subgenus of Bacterium and apparently made the first typification: "The type species is Bacterium (Salmonella) cholerae suis." However, Lignières' authorship of the name is not questioned.

6. The citation Salmonella cholerae-suis (Smith) Weldin apparently is correct. Weldin listed the correct type species.

Salmonella cholerae-suis (Smith) Weldin was recognized as type species of the genus in 1936 (Salmonella Subcommittee Report, J. Hyg. 34:333, 1934; Proc. 2nd Internat. Microbiol. Congr., London, 1937, 545).

7. The subject of the specific epithet typhosa vs. the specific epithet typhi was reviewed by Professor R.S. Breed (I.B. 5:165, 1955), by the Editorial Board (I.B. 8:155, 1958), and is under consideration by the Judicial Commission. The taxonomic subcommittee on the Enterobacteriaceae is on record as being in favor of the epithet typhi (I.B. 8:173, 1958). The specific epithet in the species Salmonella typhi should be conserved.³

8a. If the genus Salmonella is limited to three species, as in the outline, then according to the rules, the name of the third species must be that of the oldest validly published species now included in the genus other than S. cholerae-suis and S. typhi. The writer found none earlier than the species Salmonella enteriditis as used by Gaertner, 1888. Therefore, the name of the third species should be Salmonella enteriditis (Gaertner) Castellani and Chalmers. The epithets kauffmannii and enterica as used by Borman, Stuart, and Wheeler (J. Bacteriol. 48:351, 1944), and Kauffmann and Edwards (I.B. 2:2, 1952), respectively, are later objective synonyms of S. enteriditis and are illegitimate.

³ See I.B. 13:31, 1963, Opinion 18. The specific epithet typhi has been conserved over the specific epithet typhosa in the species name Salmonella typhi (Schroeter) Warren and Scott 1930. Ed.

8b. The concept of limitation of the number of species in the genus Salmonella to three apparently originated with Borman, Stuart, and Wheeler (loc. cit.). At least, these investigators first put it into print, as far as the writer has been able to determine. Borman *et al.* employed the designation kauffmannii for the third species of the genus Salmonella. However, the species was inadequately characterized, in the opinion of the writer, since the characterization was based upon antigenic structure alone. If this characterization were used alone many salmonellae could not be readily classified in the genus.

Kauffmann and Edwards (loc. cit.) also subscribed to the three species concept within the genus Salmonella, but employed the neutral designation Salmonella enterica as the name for the third species, which was defined by means of biochemical characteristics.

8c. The idea of limiting the number of species in the genus Salmonella to three is a compromise, which appears to be the only reasonable solution to a difficult problem. Alternatively, the number of species in the genus could be limited to one, in which case the name Salmonella enterica might be conserved for use in connection with it. If this single species concept were adopted, the names of the various serotypes could be written Salmonella enterica serotype typhi or Salmonella enterica (typhi), or Salmonella enterica (dublin) etc. However, tradition has demanded that the typhoid bacillus be recognized as a distinct species and if Salmonella typhi is so recognized, the type species of the genus, S. cholerae-suis, also should be given species rank.

8d. Other proposals call for recognition of the "classical species" of Salmonella. These are the salmonellae that were given specific names in the earlier days of enteric bacteriology and these names were legitimately published. The principal arguments used in favor of this proposal are that these specific names are employed by workers in the fields of bacterial physiology, genetics, etc., that the antigenic schema is not used by physiologists and geneticists, and that it is difficult to integrate the classifications used by the different groups of investigators. The author is not in agreement with the proposal or the arguments employed by its advocates. In the first place it would be impossible to obtain agreement among investigators in the various fields and in various countries on just which should be included in a

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list of "classical species." For example, the following are listed in the 6th edition of Bergey's Manual (1948):

1. Salmonella paratyphi (Kayser) Castellani and Chalmers
2. Salmonella Schottmulleri (Winslow et al.) Bergey et al.
3. Salmonella typhimurium (Loeffler) Castellani and Chalmers
4. Salmonella abortusoequina (Good and Corbett) Bergey et al.
5. Salmonella abortusovis (Lovell) Schuetze et al.
6. Salmonella abortusbovis Kauffmann
7. Salmonella hirschfeldii Weldin
8. Salmonella choleraesuis (Smith) Weldin
9. Salmonella typhisuis Glaesser (Schuetze et al.)
10. Salmonella morbificans (Migula) Haupt
11. Salmonella typhosa (Zopf) White
12. Salmonella enteritidis (Gaertner) Castellani and Chalmers
13. Salmonella gallinarum (Klein) Bergey et al.
14. Salmonella pullorum (Rettger) Bergey et al.
15. Salmonella anatis (Rettger and Scoville) Bergey et al.

However, in the 7th edition (1957), five validly published "classical species" (No. 6, 9, 10, 14 and 15 above) were not so listed. Also, it is known, through years of correspondence on the subject, that workers in some countries would include certain other salmonellae in such a list and would exclude some of those listed above. Further, many "classical species" cannot be distinguished from each other or from other salmonellae by any known means except antigenic analysis. The statement that bacterial physiologists and geneticists do not use the antigenic schema is inaccurate, since many outstanding investigators in these fields do make use of the antigenic schema. In fact, some of the most notable contributions of the last few years are dependent upon their use of the schema.

8e. Another concept that should be mentioned is that advanced by Professor Kauffmann, who has regarded each Salmonella serotype as a separate species (I.B. 9:1, 7, 1959; 11:5, 1961). This view is not shared by many others who regard the names given to Salmonella serotypes as infra-

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subspecific designations that are equivalent to, and which are used in lieu of, the antigenic formulas. (e.g., Internl. Subcomm. Enterobact., I.B. 8:178, 1958; LeMinor, Ann. Inst. Pasteur 94:207, 1958; Cowan, I.B. 9:131, 1959; Taylor, I.B. 9:159, 1959). Nevertheless, Professor Kauffmann has every right to his views on this subject and since his species are derived from the antigenic schema there is no real conflict between Professor Kauffmann's views and those of many others except in the area of the constitution of a species. However, we are of the opinion that an interpretation other than that of Professor Kauffmann can be made of the statement of P. Bruce White (Proc. 2nd Intern. Congr. Microbiol. 1937, 548) regarding Salmonella types and their being elementary species in the sense of deVries. From what the author has read it seems clear that deVries considered varieties produced by mutation as elementary species; he apparently called such mutants "elementary species." Hence, elementary species may be considered the elements of a species or the elements that make up a species, rather than as separate species.

8f. Thus, we may have one species of Salmonella or more than 800 species, or we may have a dozen to 20 species of Salmonella or three species. Anything that is done with the nomenclature of the genus Salmonella must be a compromise and the author is of the opinion that the three species concept as presented in the outline is the better choice. Several authorities in the field are in agreement with this point of view. For example, Dr. P.R. Edwards agrees with it and has stated (personal communication 1962) that the proposal made with Professor Kauffmann in 1952 (Kauffmann and Edwards, I.B. 2:2, 1952) still is his choice as the most logical solution to this problem.

8g. It should be emphasized that if this proposal is adopted, attention should be given to correct usage. Except where used in a general way, as in the outline, the name Salmonella enteritidis should not be used alone since it represents 800 and more serotypes and hence by itself would be meaningless. Instead, the name of a serotype (other than S. typhi and S. cholerae-suis) should be written Salmonella enteritidis serotype enteritidis or S. enteritidis (enteritidis), Salmonella enteritidis thompson or S. enteritidis (thompson). It matters not whether the infrasubspecific serotype designation is italicized, since the use of italics or other printing

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device does not affect the status of the serotype designations—they still are infrasubspecific designations, equivalent to, and representing, antigenic formulae. It may be suggested that authors might spell out the complete name of each Salmonella serotype the first time that it occurs in a publication. Subsequent references to the serotypes could be made simply by using serotype typhimurium, ser. anatum, or by capitalization of the initial letter. According to the proposal made herein the so-called "classical species" should be written in the same manner as given in the above-mentioned examples, e.g. Salmonella enteriditis serotype enteriditis. The specific epithets of the "classical species," other than S. cholerae-suis, S. typhi and S. enteriditis should be rejected as species names but retained as serotype designations. Thus, the "classical species" all may be integrated easily into a single nomenclatural, as well as taxonomic, system by using the "classical" epithets as serotype designations.

In our opinion, the most important requirements for progress in this area are the acceptance and use of a single system of nomenclature and that workers in all fields use that system correctly. If leading investigators in bacterial genetics and physiology can take the time and trouble to learn the means for accurate characterization of these bacteria and to attend to the details of correct terminology, as some have done, others might follow the example.

8h. Although the correct name for the third species of the genus Salmonella, as proposed herein, apparently is S. enteriditis (Gaertner) Castellani and Chalmers, it is the opinion of the author that an exception to the rules might be in order in this instance. Since it has not been employed previously in connection with salmonellae, the neutral name Salmonella enterica might be conserved for use instead of S. enteriditis. In this event, suggested usage would be the same as that outlined in the foregoing paragraphs, e.g., Salmonella enterica serotype enteriditis, Salmonella enterica (typhimurium) etc.

Precedent has been established in connection with the rejection of "classical species" in favor of a limited number of species, as well as in the use of infrasubspecific designations for serotypes within a species. In some instances these infrasubspecific designations have replaced the names of legitimately published "classical species." For example, the genus Shigella now is limited to four species, which are

further subdivided into serotypes designated by Arabic numerals. These numerals are infrasubspecific designations, each of which indicates the antigenic constitution of a serotype. Thus, the Arabic numbers used in connection with shigellae are completely analagous to the infrasubspecific names given to serotypes of Salmonella. Such "classical species" as Shigella ambigua (Shigella schmitzii) and Shigella newcastle were rejected, at least by inference, with the adoption of the present nomenclatural system, in which the former became Shigella dysenteriae serotype 2 and the latter became Shigella flexneri serotype 6.

9. The generic name Arizona and the specific epithet arizonae were given by Kauffmann and Edwards in 1952 (I.B. 2:2).

9a. The first member of the group presently known as Arizona was isolated, described, and named Salmonella sp. (Dar-es-salaam type variety from Arizona) (sic) by Caldwell and Ryerson (J. Infect. Diseases, 65:242, 1939). According to Professor Kauffmann's more recent proposals (Acta Path. Microbiol. Scand. 49:393, 1960; Kauffmann, 1961), the Arizona group might be designated Salmonella subgenus III. If such a taxonomic change were made, the Arizona group might be added to the genus Salmonella as a fourth species, Salmonella arizonae Kauffmann (1941) emend.

10. The generic term Citrobacter was proposed by Werkman and Gillen (J. Bacteriol. 23:165, 1932) who transferred the bacterium described by Braak to the genus as Citrobacter freundii.

11. A brief review of the nomenclature of the tribe Klebsielleae was given by Ewing, Davis, and Johnson (I.B. 12:47, 1962). Since the generic term Klebsiella Trevisan was conserved (Code, 166) and Klebsiella pneumoniae (Schroeter) Trevisan was designated type species of the conserved genus (Code, 166) it is clear that the name of this tribe should be Klebsielleae.

12. A brief review of the literature regarding the term "oxytoca" is in order since the term has been used in a variety of combinations and in connection with several biotypes of bacteria. Bacillus oxytocus perniciosus (Wyssokowitsch) Fluegge was isolated from stale milk by Wyssokowitsch in Professor Fluegge's laboratory. It was named by Fluegge and was described as being gelatin negative. Trevisan (1889, 17, v. I.B. 2:13, 1952) referred to the above-

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mentioned description and used the name Bacillus oxytocus, which was the first correct binary combination used in connection with the microorganism (validly published). MacConkey (J. Hyg. 6:384, 1906) obtained a culture of B. oxytocus perniciosus from the Král collection. This culture, which was supposedly from Fluegge, was nonmotile, failed to form indol, failed to liquefy gelatin, and gave a positive Voges-Proskauer test. These reactions, as well as others listed by MacConkey, are similar to those given by Klebsiella pneumoniae strains. The epithet was also employed by Castellani and Chalmers (1919), who described an indol positive bacterium otherwise like K. pneumoniae under the designation Escherichia oxytocus. In 1909, MacConkey described gelatin positive, indole positive, nonmotile forms under the designation B. oxytocus perniciosus (J. Hyg. 9:86, 1909). The term Aerobacter oxytocus was employed in Bergey's Manual (1923) by Weldin (1927), and in 4th edition of Bergey's Manual for nonmotile, indol positive, gelatin negative bacteria having the general characteristics of klebsiellae. Thus it is clear that the most authentic description of B. oxytocus perniciosus is the characterization of the isolant from the Král collection given by MacConkey (1906 loc. cit.). It also is apparent that the epithet oxytocus is a later synonym of the epithet pneumoniae Trevisan, 1885, and hence illegitimate.

More recently several authors (e.g. Lautrop, Acta Path. Microbiol. Scand. 39:375, 1956) have included indol positive, gelatin positive, strains under the designation "oxytoca," as did MacConkey (1909, loc. cit.), and others (Cowan et al. J. Gen. Microbiol. 23:601, 1960) have doubted that such cultures should be called klebsiellae. The only essential difference between the oxytoca strains and other indol positive klebsiellae presently known is gelatin liquefaction, which is delayed. Hence, there is little doubt but that the bacteria are Klebsiella. However, it is believed that the oxytoca strains are not sufficiently different to warrant status as a separate species. They are regarded as a biotype of K. pneumoniae, which may be called the oxytoca biotype if desired. This biotype would include cultures that are both indol and gelatin positive.

The species name K. oxytoca should be rejected.

13. Action by the Judicial Commission is pending on Aerobacter vs. Enterobacter (Hormaeche and Edwards, I.B. 10:71, 1960).

14. The bacteria classified in the Hafnia group are closely related to Aerobacter aerogenes and are regarded as a subspecies (variety) of that species. It is clear that sufficient differences exist between members of the Hafnia group and cultures of A. aerogenes to warrant the sub-specific designations. If additional differences of taxonomic importance are found in future, this group of bacteria may be elevated to specific rank, in which case the appropriate name would be Aerobacter hafniae. Conversely the group may be lowered to biotype status if future studies indicate that this is desirable. However, it is clear that generic rank is not warranted at this time.

15. Aerobacter liquefaciens Grimes and Hennerty (Sci. Proc. Roy. Dublin Soc. 20(NS):89, 1931) vs. Aerobacter lipolyticus Grimes (I.B. 11:111, 1961). The species name Aerobacter liquefaciens Beijerinck is regarded as illegitimate since it is a later synonym of Aeromonas hydrophila (Chester) Stanier. The bacterium described by Beijerinck under the name Aerobacter liquefaciens is considered to be Aeromonas hydrophila by the author (v. Ewing et al. 1961). Thus, it would seem that the epithet liquefaciens is available (Rule 26, Code, 97) for use, that the combination Aerobacter liquefaciens Grimes and Hennerty is legitimate, and that A. lipolyticus is a later synonym.

However, a ruling on lipolyticus vs. liquefaciens and conservation of A. liquefaciens or A. lipolyticus is desirable.

16. The nomenclature and taxonomy of the genus Serratia were discussed by Ewing, Davis, and Johnson (I.B. 12:47, 1962).

17. The nomenclature and taxonomy of the tribe Proteeae were discussed by Ewing (I.B. 12:102, 1962).

As stated at the outset, the outline of nomenclature for the family Enterobacteriaceae presented follows the taxonomic system published earlier (Ewing and Edwards 1960, revised 1962) and the biochemical methods given in that publication may be regarded as the basis for the tribes, genera, and species given in the outline of nomenclature.

The terminology employed in the outline is nomenclaturally legitimate, as far as we have been able to determine. However, there are a number of points on which action by the Judicial Commission is either necessary or desirable. These are summarized as follows, for convenience:

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1. Since the type species of the genus Escherichia was designated as Escherichia coli, it may be inferred that the specific epithet coli was conserved. However, definite conservation of Escherichia coli would be desirable. (Annot. 3).

2. The species name Salmonella typhi (or S. typhosa) should be conserved. The name that is not conserved should be rejected. (Annot. 7).

3. The name Salmonella kauffmannii should be rejected as a name for a third species of Salmonella. (Annot. 8a).

4. The name Salmonella enteriditis (or S. enterica) should be conserved for use as the name of the third species of Salmonella. (Annot. 8a, 8h). If Salmonella enterica is deemed unacceptable, this name should be rejected as far as usage in this context is concerned.

5. Arizona arizonae Kauffmann and Edwards is named herein as the type species of the genus Arizona.

6. The specific name Klebsiella oxytoca should be rejected, since it is a later objective synonym of Klebsiella pneumoniae. (Annot. 12).

7. Action should be taken on the subject of Aerobacter vs. Enterobacter, with conservation of one and rejection of the other. (Annot. 13).

8. Conservation of the specific name Aerobacter liquefaciens Grimes and Hennerty or Aerobacter lipolyticus Grimes is needed. (Annot. 15).

9. Proposals made regarding the nomenclature of the genus Serratia and the tribe Proteeae should be acted on. (Annot. 16, 17).

The attention of members of the Judicial Commission and of the Nomenclature Committee is directed to the above-mentioned points. It is respectfully requested that the points be considered and that necessary action be taken on them. Further, it is respectfully requested that the proposed nomenclatural system, as given in the outline, be considered and that action be taken to determine whether the system is nomenclaturally correct.

Whether or not a system of nomenclature is "accepted" depends upon usage. The system presented herein was developed directly from a practical taxonomic schema which has been used to considerable advantage for a number of years, and which has found rather wide acceptance. Hence, it would seem to the writer that a nomenclatural system

derived from a tested practical taxonomic schema should be useful and advantageous. The author can see no reason why the nomenclature outlined herein cannot be used to advantage by investigators in bacterial physiology, genetics, or any other field, when they are working with members of the family Enterobacteriaceae. Strains of a particular species that differ from the parent from which they were derived, which produce some substance or fail to do so, or which are dependent upon or resistant to some agent, may easily be distinguished by the use of a suitable symbol along with the correct nomenclatural designation. Usage of correct nomenclature may be expected to lend clarity to the publications of workers in all fields of bacteriology. Parenthetically, we might note that additional species or subspecies may be added to the various genera when the need arises and also additional genera or tribes should it become necessary. However, additions should not be made indiscriminately.

As stated earlier, the writer is of the opinion that the most important requirements in this area are the adoption of a single system of nomenclature for the family Enterobacteriaceae and that investigators in all fields of bacteriology use that system correctly when dealing with members of the family. We believe that the nomenclature outlined herein can be recommended as such a single system, that its use will prove to be advantageous, and that if used, it eventually will find acceptance.

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ADDENDUM

After this paper was received, the Judicial Commission of the International Nomenclature Committee acted upon the request of Hormaeche and Edwards (I.B. 10:77-78, 1960) and conserved the generic name Enterobacter Hormaeche and Edwards (Opinion 28, I.B. 13:38, 1963). Thus, Genus II of Tribe III becomes:

Genus II Enterobacter Hormaeche and Edwards

1. Enterobacter cloacae (Jordan) Hormaeche and Edwards
2. Enterobacter aerogenes (Kruse) Hormaeche and Edwards
 - 2a. Enterobacter aerogenes subspecies hafniae (Moeller) Ewing comb. nov.
3. Enterobacter liquefaciens (Grimes and Hennerty) Ewing comb. nov.