International Committee on Systematic Bacteriology Subcommittee on the Taxonomy of *Mollicutes*

Minutes of the Interim Meeting, 30 August and 6 September 1982, Tokyo, Japan

Session 1. Closed meeting

Minute 1. Call to order. A closed meeting was called to order at 10:15 on 30 August 1982 by the Chairman, E. A. Freundt. The Subcommittee was welcomed by O. Kitamoto, Chairman of the Local Organizing Committee of the International Organization for Mycoplasmaology (IOM) and by M. Ogata and H. Kobayashi of the Local Committee. The Subcommittee, in return, expressed its appreciation for the Committee's warm hospitality.

Minute 2. Record of attendance. Members present were: E. A. Freundt (Chairman), R. F. Whitcomb (Secretary), M. F. Barile, J. M. Bové, H. Neimark, S. Razin, D. Taylor-Robinson, J. G. Tully, and P. Whittlestone. Correspondence concerning Minutes 4 and 17 was received from R. Lemcke.

Minute 3. Report of the Chairman. The activities of the Subcommittee since the previous meeting in Custer, S.D., were summarized by the Chairman. Extensive attempts were made to facilitate publication of the minutes of the 1978 (sic) meetings in Freiburg and Munich; these minutes were delayed internally in ICSB channels. Finally, it was decided to circulate the minutes of the 1978 and 1980 meetings privately. Although these were in preparation, galley proofs for a shortened, extensively edited version of the 1978 minutes (Int. J. Syst. Bacteriol. 32:261–264, 1982) were received. All literature citations were excised. It was therefore decided to provide complete minutes of the 1978, 1980, and 1982 Subcommittee meetings after the Tokyo meeting. It was further agreed that the feasibility of publishing a summary of the open and closed sessions in the proceedings of the IOM meeting would be investigated. (Note that this did not prove to be feasible. This document fulfills the stated intention.)

Minute 4. *Mollicute* phylogeny. The Subcommittee discussed, at great length, the phylogeny and evolution of *Mollicutes*, including correspondence concerning the subject from absent members. There was general agreement that classification should, ideally at least, be based on phylogeny, since the continuity provided by evolution supplies a good a priori basis for predicting phenotypic characters. Some new lines of evidence had become available since the previous meeting. For example, information was available concerning the number of ribosomal ribonucleic acid (rRNA) genes (D. Amikam, S. Razin, and G. Glaser, Nucleic Acids Res. 10:4215–4222, 1982; M. Sawada et al., Mol. Gen. Genet. 182:502–504, 1981) and sequencing of 5S rRNA (R. T. Walker et al., Nucleic Acids Res. 10:6363–6367, 1982) of *Mollicutes*. Studies on the structure of key enzymes (K. E. Sjostrom and G. E. Kenny, Int. J. Syst. Bacteriol. 33:218–228, 1983) such as reduced nicotinamide adenine dinucleotide and adenosine triphosphatase also proved to be informative. The possible relationships of acholeplasmas to streptococci were discussed at length. Although a number of similarities are evident, streptococci have a larger genome than do acholeplasmas and six rRNA genes as compared with two in acholeplasmas. Evolution of the family *Acholeplasmataceae* from gram-positive bacteria must have involved the deletion of a substantial segment of the genome.

The Subcommittee stressed the need for more data on genome sizes of representative organisms and discussed difficulties of obtaining reproducible and reliable genome size data by present-day techniques, which are based largely on deoxyribonucleic acid (DNA) renaturation. It was also suggested that it would be of great value to tentatively select a short series of strains that were representative of the known diversity of *Mollicutes*. All deliberations on mollicute phylogeny should, of course, take full note of the 16S rRNA catalogs developed by C. R. Woese, G. E. Fox, and colleagues (G. E. Fox et al., Science 209:457–463, 1980; C. R. Woese, J. Maniloff, and L. B. Zablen, Proc. Natl. Acad. Sci. U.S.A. 77:494–498, 1980) and of Walker's studies on transfer ribonucleic acid (R. T. Walker et al., Nucleic Acids Res. 10:6363–6367, 1978), which have been interpreted as demonstrating a division between the branches represented by *Mycoplasmataceae-Spiroplasmataceae* and *Acholeplasmataceae*. This division is of sufficient depth that a polyphyletic origin of the branches has been suggested (Woese, Maniloff, and Zablen, Proc. Natl. Acad. Sci. U.S.A. 77:494–498, 1980). On the other hand, sequencing of 5S rRNA and unpublished data concerning insensitivity of *Mollicutes* to rifampin (J. M. Bové, unpublished data) suggest some coherence to the concept of *Mollicutes* (Maniloff, Annu. Rev. Microbiol. 37:477–499, 1983; Walker et al., Nucleic Acids Res. 10:6363–6367, 1982). Thus, indications from phylogenetic data are somewhat conflicting. Although all the results are clearly of great value and provide important evidence in support of elevation of the family *Acholeplasmataceae*, the Subcommittee felt it would be unwise to modify the higher classification of *Mollicutes* in any other way at present.

Minute 5. Elevation of *Acholeplasmataceae* to ordinal status. According to a decision made by the Subcommittee at its meeting in Custer, S.D., 1980 (Int. J. Syst. Bacteriol. 34:358–360), a draft document proposing the elevation of the family *Acholeplasmataceae* to ordinal rank was prepared by a working group. The document that was submitted for the consideration of the Subcommittee summarized various nutritional, biochemical, physiological, and genetic characteristics in which *Acholeplasmataceae* differs from *Mycoplasmataceae* and, to a lesser but significant extent, from *Spiroplasmataceae*. It was felt that many unique characteristics distinguish *Acholeplasmataceae* from other families of *Mollicutes* and, as a consequence, that the family merits recognition as a new order of *Mollicutes*, *Acholeplasmatales*. Further justification for this proposal was found in the growing recognition of fundamental heterogeneity among species currently assigned to the genus *Acholeplasma*. The proposal was therefore endorsed.

Minute 6. Higher taxonomy of the *Mollicutes*. In 1978, Gibbons and Murray proposed (N. E. Gibbons and R. G. E. Murray, Int. J. Syst. Bacteriol. 28:1–6, 1978) recognition of wall-less procaryotes as a division of the kingdom *Procaryotae* but chose the preoccupied name *Mollicutes* for the new division. The Subcommittee previously endorsed the concept of divisional status for *Mollicutes* but at the same time expressed concern about the nomenclatural difficulties that

were created (Int. J. Syst. Bacteriol. 32:261–264, 1982). A draft document was submitted to the full Subcommittee by a working group appointed at the Custer, S.D., meeting. The Subcommittee discussed the draft and the issues that were raised pertaining to higher taxonomy of the *Mollicutes*. It was agreed that (i) the class name should remain *Mollicutes*, as was proposed and validly published by D. G. ff Edward and E. A. Freundt (J. Gen. Microbiol. 57:391–395, 1969) and that the proposal of N. E. Gibbons and R. G. E. Murray to use the name *Mollicutes* for a division appeared to be invalid; (ii) a new name is therefore required for the proposed division; various possibilities were discussed. (Note: R. G. E. Murray has recently informally proposed [Bergey's Manual of Systematic Bacteriology, 9th ed., p. 31–36, The Williams & Wilkins Co., Baltimore] the name "*Tenericutes*" ["soft skin"] for the division); (iii) the new order *Acholeplasmatales*, created by elevation of the family *Acholeplasmataceae* (Minute 5), will be included (iv) the higher classification of the genus *Anaeroplasma* is uncertain, but recent nucleic acid data strengthen the view that this genus is different from representatives of currently recognized families and may merit elevation; (v) the use of the trivial or common name "mollicute," rather than "mycoplasma," for members of the class *Mollicutes* is recommended. Trivial names for members of the genera *Acholeplasma*, *Spiroplasma*, *Ureaplasma*, and *Anaeroplasma* can be formed directly by writing their first letters in lower case; if this system is adopted and comes into general usage, the trivial term "mycoplasma" may eventually be understood to represent only members of the genus *Mycoplasma*, a concept for which no trivial term has been available; (vi) the genus *Thermoplasma* is not referable to the class *Mollicutes* and should be excluded, since these organisms are closely related to the genus *Sulfolobus* in the *Archaeobacteria* (W. E. Balch, G. E. Fox, L. J. Magrum, C. R. Woese, and R. S. Wolfe, Microbiol. Rev. 43:260–296, 1979; Maniloff, Annu. Rev. Microbiol. 37:477–499, 1983).

Minute 7. Species concept in Spiroplasma. The Subcommittee noted that the current classification of the genus (Junca et al., C. R. Acad. Sci., Ser. D 290:1209–1212, 1981; Whitcomb et al., Curr. Microbiol. 7:291–296, 1982; Whitcomb et al., Yale J. Biol. Med., 56:453–459, 1982) includes 11 major groups or serogroups, all of which are completely distinct by growth inhibition, metabolism inhibition, and deformation serology. Studies on the genomes of the organisms are incomplete, but where available, the results of such studies support the serologic data. Three of the groups received binary names. Problems in species taxonomy are, however, presented by the subgroups of group I and the heterogeneous array of strains of group IV. (Note: group IV has since been named *Spiroplasma apis* [Mouches et al., Ann. Microbiol. (Paris) 134A:383–397, 1983].)

Group IV represents strains with complex patterns of interrelationships. A proposal [Davis and Lee, Rev. Infect. Dis. 4(Suppl.):S122–S128, 1982] to erect separate species for group IV strains such as SR 3 and PPS1, which share major antigenic determinants as measured by growth inhibition serology (J. G. Tully et al., Curr. Microbiol. 3:369–372, 1980), is unacceptable. In contrast, certain subgroups of group I (I-1, I-2, and I-3) have been studied extensively. These studies provide a model for requirements that should be fulfilled if it is desired to elevate a subgroup to species rank. These include (i) fulfillment of all steps required in the minimal standards document; (ii) demonstration that the DNA-DNA homology between the candidate subgroup and all other subgroups is less than 70%; (iii) study of the ecology

of the organism and identification of principal hosts or alternate hosts or both; (iv) recognition that the subgroup is of exceptional importance to agriculture or public health or as a basic microbiologic model; and (v) demonstration that the subgroup consists of a cluster of homogeneous strains that were isolated from as many different circumstances as possible. Strain homogeneity should be assessed by techniques such as serology and two-dimensional polyacrylamide gel electrophoresis (PAGE). The degree to which individual data sets fulfill these requirements was left to the judgment of authors and manuscript referees.

Minute 8. Species concept in Acholeplasma. The Subcommittee discussed the species concept for the genus *Acholeplasma*. DNA-DNA hybridization (G. S. Aulakh, E. B. Stephens, D. L. Rose, J. G. Tully, and M. F. Barile, J. Bacteriol. 153:1338–1341, 1983; G. S. Aulakh, J. G. Tully, and M. F. Barile, Curr. Microbiol. 2:91–94, 1979; Stephens et al., Curr. Microbiol. 5:367–370, 1981; Stephens et al., J. Gen. Microbiol. 129:1929–1934, 1983), restriction enzyme (S. Razin et al., J. Gen. Microbiol. 129:1935–1944, 1983), and isoenzyme (S. J. O'Brien, J. M. Simonson, M. W. Grabowski, M. F. Barile, J. Bacteriol. 146:222–232, 1981) studies correlate well. Eight established species of *Acholeplasma* and a new species (*Acholeplasma florum* [R. E. McCoy, H. G. Basham, J. G. Tully, D. L. Rose, P. Carle, and J. M. Bové, Int. J. Syst. Bacteriol. 34:11–15, 1984]) are quite distinct, showing 21% or less DNA homology. In most comparisons, there was less than 8% homology, although within a cluster of four species (*Acholeplasma laidlawii*, *Acholeplasma granularum*, *Acholeplasma hippikon*, and *Acholeplasma oculi*), values of 10 to 21% homology were observed. The greatest amount of homology (21%) was seen between type strains of *A. laidlawii* and *A. granularum*, confirming earlier results (H. Neimark, J. Gen. Microbiol. 63:249–263, 1970). Homologies among 21 strains of *A. laidlawii* and six strains of *Acholeplasma axanthum* isolated from diverse sources, hosts, and habitats were also examined. The DNA probes derived from strains PG9, L, and MIST produced a range of values of 71 to 89%, 64 to 90%, and 62 to 93%, respectively, to DNA preparations from the other strains of *A. laidlawii*. Five strains of *A. laidlawii* showed less than 70% homology to any of the three DNA probes; no strain showed less than 70% homology to the type strain, PG9. The DNA probes of S743 and Swine D1 showed intrastrain homology values ranging from 52 to 70% and 48 to 81%, respectively, for comparison with five other strains of *A. axanthum*. The data suggest that the habitats, and especially hosts, may have a selective influence on the *Acholeplasma* flora and that existing species are comprised of clusters of diverse clones whose ecologies are poorly understood. Isoenzyme data indicate that the *Acholeplasma* species derived from animal sources may be different from those isolated from plants and insects; e.g., many of the animal *Acholeplasma* species have superoxide dismutases, whereas this enzyme activity was not present in the few plant *Acholeplasma* species examined. Although these data provide preliminary guidelines for the establishment of a species concept for the genus *Acholeplasma*, examination of many additional strains, especially from plants and insects, will be required before a firm concept can be set forth.

Minute 9. Species concept in Ureaplasma. The Subcommittee discussed at some length the species concept in *Ureaplasma*. In the past 2 years, several papers have been published, or work has been done, to indicate that the serovars that comprise *Ureaplasma urealyticum* fall into two groups. The guanine-plus-cytosine ratio for the first eight

serovars (those tested) has a narrow range (27 to 27.8 mol%), but the results of one- and two-dimensional PAGE studies show that serovars II, IV, V, VII, and VIII form one group and serovars I, III, and VI form another group. These groupings are confirmed by the observation (C. Christensen, F. T. Black, and E. A. Freundt, *Int. J. Syst. Bacteriol.* **31**:259–262, 1981) that members of the group share only a limited DNA-DNA homology (40 to 60%) and that characteristic restriction endonuclease patterns are shared by members of each group (S. Razin, R. Harasawa, and M. F. Barile, *Int. J. Syst. Bacteriol.* **33**:201–206, 1983). However, the Subcommittee was of the opinion that it would be unwise to describe a second human *Ureaplasma* species at this time. It was felt that designation of a species sharing substantial DNA-DNA homology with *U. urealyticum* might lead to proposal of unwelcome names in the future. If further work indicated that there was less homology or, especially, that pathogenicity was associated with serovars of only one group, then a second species name might be useful. At the moment, however, *U. urealyticum* comprises two groups: group A, containing serovars I, III, and VI, and group B, containing serovars II, IV, V, VII, VIII, and IX. Whether all 14 recognized serovars will be referable to one of these two groups remains to be seen.

Since the bovine ureaplasmas are different from both groups of the human ureaplasmas serologically and by one- and two-dimensional PAGE and because the guanine-plus-cytosine ratios of the human and bovine ureaplasmas do not overlap, it is appropriate to propose a species name for the bovine ureaplasmas. (Note: *Ureaplasma diversum* has been proposed [C. J. Howard and R. N. Gourlay, *Int. J. Syst. Bacteriol.* **32**:446–452, 1982].)

To establish additional species within the genus *Ureaplasma*, the Subcommittee considered that it would be necessary to demonstrate that serovars within the proposed species differ from those of *U. urealyticum* and *U. diversum* on the basis of serology, PAGE, and DNA-DNA hybridization. Although *Ureaplasma* species seem to be very habitat specific (i.e., human, bovine, etc.), the Subcommittee felt that species of this or any genus could nevertheless be defined only on the basis of the intrinsic properties of the organisms.

Minute 10. Taxonomic status of the genus *Mycoplasma*. The Subcommittee, although agreeing that the species concept in *Mycoplasma* was well established, discussed the genus concept at some length. It was noted that at present the genus comprises a diverse group of organisms. Of special concern was the inclusion in a single genus of organisms whose guanine-plus-cytosine contents range from 23 to 39 mol% and which vary in their ability to ferment glucose. Although this diversity has been recognized for many years (G. E. Kenny, *In* M. F. Barile and S. Razin [ed.], *The mycoplasmas*, vol. 1, p. 351–384, Academic Press, Inc., New York, 1979; H. Neimark, *J. Gen. Microbiol.* **63**:249–263, 1970), the Subcommittee agreed that further study of characteristics that discriminate at the generic and family levels would be required before the acknowledged diversity could receive taxonomic recognition. A working team, consisting of H. Neimark, A. Rodwell, and S. Razin, will study the issues.

Minute 11. Current status of the genus *Anaeroplasm*. The Subcommittee noted that progress in the classification of *Anaeroplasm* has been made by separation of sterol-nonrequiring forms from sterol-requiring strains in the forthcoming edition of *Bergey's Manual* (I. M. Robinson, *In* *Bergey's Manual of Systematic Bacteriology*, 9th ed., p.

787–790). Studies on DNA-DNA homologies among recognized serovars are in progress, as are determinations of the genome size. Results from these studies should clarify the taxonomic status of the genus.

Minute 12. Status of "*Methanoplasma elisabethii*." The Subcommittee briefly discussed the status of a methanogenic, obligately anaerobic organism that was assigned the name "*Methanoplasma elisabethii*" (C. S. Rose and S. J. Pirt, *J. Bacteriol.* **147**:248–254, 1981) and was further assigned to the order *Mycoplasmatales*. The name proposed for the organism was not validly published, and no type strain was designated or deposited in a recognized culture collection. Also, it is not clear from the published description that the organism is a mollicute. The Subcommittee will contact the journal in which the article was published to express its concern.

Minute 13. Minimal standards for species descriptions. The Subcommittee reaffirmed the need to periodically update its document describing minimal standards that should be fulfilled for description of new species in *Mollicutes*. It was felt that a revision of the document published in 1979 should be considered, perhaps by 1984 or 1985. The Subcommittee also felt that amendments to the document could be made through the published minutes of the Subcommittee meetings, offering a means of incorporating important new techniques in mycoplasma characterization. For example, the Subcommittee encouraged the use of two-dimensional PAGE (C. Mouches and J. M. Bové, *In* S. Razin and J. G. Tully (ed.), *Methods in mycoplasma*, vol. 1, p. 241–255, 1983) and determination of the restriction endonuclease patterns of mycoplasma DNA (C. Saillard and J. M. Bové, *In* S. Razin and J. G. Tully (ed.), *Methods of mycoplasma*, vol. 1, p. 313–318, 1983) as recommended optional tests for description of new mollicutes. The Subcommittee would like to receive comments from the community of mycoplasma research workers concerning revisions that should be considered for a revised document.

Minute 14. Establishment of type culture collections of viruses and plasmids. The Subcommittee expressed concern regarding establishment of collections of mollicute strains that are known to harbor viruses and plasmids. Difficulties in technology may prevent this from being done at present.

Minute 15. Status of approved names. The name *Spiroplasmataceae* Skripal was inadvertently omitted from the list of approved names. A manuscript that will effect revival of the name has been drafted by Dr. I. G. Skripal (Note: This paper has now appeared in print [I. G. Skripal, *Int. J. Syst. Bacteriol.* **33**:408, 1983].)

Minute 16. New techniques in mollicute taxonomy. The use of two-dimensional PAGE (see Minute 13), high-pressure liquid chromatography for direct determination of guanine-plus-cytosine contents (A. Razin and S. Razin, *Nucleic Acids Res.* **8**:1383–1390, 1980), and restriction endonuclease enzymes (see Minute 13) as techniques of future significance was stressed.

Minute 17. Liaison with ASM Subcommittee on taxonomy of the Mollicutes. This Subcommittee, although relatively inactive during the last 2 years, serves as a means for channeling input on mollicute taxonomy from ASM members.

Minute 18. Liaison with the IOM-IRPCM Board. A report of the Board was prepared after the 1980 meeting in Custer, S.D. Linkage between the IRPCM and the Subcommittee was strengthened by invitation of the Secretary of the Subcommittee to serve as a Board member. Ties to the IOM were further strengthened.

Minute 19. Publication of taxonomic manuscripts. Special concern was voiced regarding the backlog of papers of taxonomic content in the *International Journal of Systematic Bacteriology*. It was agreed that current publication loads justified expansion of page limits for the journal. The Chairman volunteered to write a letter to the ICSB Chairman, and several members of the Subcommittee volunteered to contact appropriate officials of the journal to express concern. (Note: Since the Tokyo meeting, expansion of the editorial staff of the journal has reduced the backlog, and the journal is now on a rapid publication schedule.)

Minute 20. Membership of the Subcommittee. E. A. Freundt will remain Chairman, and R. F. Whitcomb will remain Secretary. Three new members, K. Koshimizu, R. Leach, and T. A. Chen, were added. It was agreed that a new group of corresponding members (advisory members) was needed. A. Rodwell was elected as the first member of the new group. J. Maniloff requested a move from full to advisory status.

Minute 21. Adjournment. The meeting was adjourned at 20:15.

Session 2. Open meeting

Minute 22. Call to order. An open meeting was called to order at 16:00 on 6 September 1982 by the Chairman at a session of the IOM held in Tokyo.

Minute 23. Record of attendance. Members present were: E. A. Freundt (Chairman), R. F. Whitcomb (Secretary), M. F. Barile, J. M. Bové, T. A. Chen, G. Cottew, K. Koshimizu, H. Neimark, S. Razin, D. Taylor-Robinson, J. G. Tully, and P. Whittlestone.

Minute 24. Report of the Chairman. The Chairman welcomed approximately 50 observers to the meeting and stressed the importance of general participation by IOM members in Subcommittee activities. Also, the openness of the Subcommittee to receipt of proposals or requests for opinion was emphasized.

Minute 25. Proceedings of closed meeting. The Secretary briefly summarized proceedings of the closed meeting of 30 August 1982.

Minute 26. Mollicute phylogeny. The details of recent evidence concerning mollicute phylogeny (see Minute 4) were summarized by S. Razin.

Minute 27. Taxonomic status of Mollicutes. The current taxonomic status of *Mollicutes* (see Minute 6) was summarized by P. Whittlestone, who emphasized the proposal of N. E. Gibbons and R. G. E. Murray (Int. J. Syst. Bacteriol. 28:1-6, 1978). The impact of this proposal on the higher taxonomy of the *Procarotae* was discussed by N. Gourlay and G. Kenny.

Minute 28. Elevation of Achleplasmataceae. The proposed elevation of *Achleplasmataceae* to ordinal rank (see Minute 5) was discussed by E. A. Freundt.

Minute 29. Species concept in Spiroplasma. The species concept in *Spiroplasma* was discussed by J. Bové. Emphasis on "clonality," or cohesiveness of the genome, was given, using as examples the pathogens of citrus stubborn disease (*Spiroplasma citri*, group I-1) and "May disease" of bees (*Spiroplasma apis*; [Mouches et al., Ann. Microbiol. {Paris} 134A:383-397, 1983]). The criteria required for elevation of subgroups to species status was discussed. C. Howard then stressed that the DNA-DNA homology range from 40 to 70% is a "gray area" in which examination of various criteria is necessary to reach taxonomic conclusions. R. E. Davis requested clarification of the use of pathogenicity as one of the criteria to be applied to organisms found to be in the gray

area, emphasizing that the type strain of *S. citri* had not been shown to be pathogenic. Members of the Subcommittee pointed out that loss of pathogenicity in culture, or in extended residence in hosts in the absence of transmission, is common. This, of course, does not obscure the coherence of the genome of organisms (including pathogens) with specific host associations that permit their recognition as unique taxa. These concepts were further discussed by R. Townsend, with special reference to the utility of two-dimensional gels for taxonomic separations. J. Bové emphasized that two-dimensional gels are of importance not only in revealing dissimilarity but in revealing patterns of similarity that may be masked by differences in a few major proteins that are especially apparent in one-dimensional gels.

Minute 30. Species concept in Achleplasma. The species concept in *Achleplasma* (see Minute 8) was summarized by J. G. Tully.

Minute 31. Taxonomic status of Mycoplasma. The taxonomic status of the genus *Mycoplasma* was discussed by H. Neimark. A letter from A. Rodwell to the Subcommittee, received after the closed meeting, was then read by G. Cottew. A. Rodwell stressed heterogeneity of the genus *Mycoplasma* with respect, for example, to metabolic pathways. Generic concepts might be used, among others, for the group consisting of the various subspecies and types of *Mycoplasma mycoides* and *Mycoplasma capricolum*. The question of other natural clusters, such as *Mycoplasma agalactiae*, was also discussed. Use of restriction endonuclease analyses and two-dimensional gel patterns, with possible computerized assistance, was emphasized. The Subcommittee agreed to give serious consideration to the submitted suggestions.

Minute 32. Species concept in Ureaplasma. The species concept in *Ureaplasma* (see Minute 9) was summarized by D. Taylor-Robinson. Conservative approaches were recommended. Brief discussion of J. Robertson, C. Howard, and P. Quinn clarified both the subdivision of *U. urealyticum* into two groups and the current uncertainty regarding association of pathogenicity with particular serovars. Only careful typing of all ureaplasma serovars colonizing patients with symptoms of urogenital disease can clarify such associations.

Minute 33. Minimal standards for species descriptions. The current status of minimal standards for description of new species of *Mollicutes* was summarized by J. G. Tully. Future input from IOM members was encouraged. The revised document (Int. J. Syst. Bacteriol. 29:172-180, 1979) applies to current research with the following amendments: (i) Minutes of the Subcommittee meetings will be used to update the document; (ii) it is not mandatory to examine two clones of a candidate strain in all tests, but it is desirable to do so in selected tests; (iii) it is highly desirable to define the restriction endonuclease and two-dimensional PAGE patterns of a candidate species; and (iv) the requirement that species should be serologically differentiable is clarified. For species descriptions, serologic differences from other species must be shown that imply a high degree of protein heterogeneity. If any crosses are evident in growth inhibition, extensive evidence of other kinds would be required.

Minute 34. Election of advisory member. The Subcommittee elected A. Rodwell to be its first advisory member. J. Maniloff has since requested that his status be changed from ordinary to advisory member.

Minute 35. Adjournment. The meeting was adjourned at 17:15.

Minute 36. Current membership. The present membership of the Subcommittee is as follows: E. A. Freundt (Chairman), Aarhus, Denmark; R. F. Whitcomb (Secretary), Beltsville, Md.; M. F. Barile, Bethesda, Md.; J. M. Bové, Bordeaux, France; T. A. Chen, New Brunswick, N.J.; G. S. Cottew, Parkville, Victoria, Australia; H. Ernø, Aarhus, Denmark; K. Koshimizu, Tokyo, Japan; R. Leach, Norwich, United Kingdom; Ruth Lemcke, Compton, United

Kingdom; H. Neimark, Brooklyn, N.Y.; S. Razin, Jerusalem, Israel; D. Taylor-Robinson, London, United Kingdom; J. G. Tully, Frederick, Md.; P. Whittlestone, Cambridge, United Kingdom. Advisory members: A. Rodwell, Parkville, Victoria, Australia; J. Maniloff, Rochester, N.Y.

R. F. WHITCOMB, *Secretary*