Minutes

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International Committee on Systematics of Prokaryotes

Subcommittee on the taxonomy of *Brucella*

Minutes of the meeting, 17 September 2003, Pamplona, Spain

Minute 1. Call to order. The Chairman, A. MacMillan, called the meeting to order at 12:15 on 17 September 2003, in the Science Building Auditorium at the University of Navarra, in Pamplona, Spain. The meeting was held during the Brucellosis 2003 International Research Conference. The aim of this meeting was to focus on the resurrection of the Subcommittee on the Taxonomy of *Brucella*, and the meeting was announced as a confirming follow-up of the meeting in Nîmes, France, in 2000 [MacMillan, *Int J Syst Evol Microbiol* **56** (2006), 1171].

Minute 2. Record of attendance. Members present were: A. MacMillan (Chairman) (UK), T. Ficht (Secretary) (USA), M. Banai (Israel), J. Godfroid (Belgium), A. López-Merino (Mexico), E. Moreno (Costa Rica) and I. Moriyón (Spain). A. Cloeckert (France) and M. J. Corbel (UK) were not present. The meeting had been announced as an open meeting, and everyone interested in the Subcommittee on the Taxonomy of *Brucella* was invited, resulting in a total attendance of more than 50 people (including D. Ewalt and B. Osterman).

Minute 3. Taxonomy, classification and nomenclature. After a brief discussion, the entire attending forum agreed unanimously upon a proposal by B. Osterman on a return to pre-1986 taxonomic opinion on the genus *Brucella*, without any objections or reservations. The Subcommittee decided to contact representatives of the Judicial Commission of the International Committee on Systematics of Prokaryotes in order to clarify the background to ensure that this recommendation on a change in taxonomic opinion on the genus *Brucella* was in accordance with the *International Code of Nomenclature of Bacteria* (the *Bacteriological Code*); contact was made immediately after the meeting and required clarification was passed between the members. Thus, the *Brucella* Subcommittee is taking a clear position on a return to pre-1986 *Brucella* taxonomy; the consequences of this statement imply the re-approval of the six *Brucella* nomenspecies with recognized biovars. The classical names relating to these six *Brucella* nomenspecies are validly published in the *Approved Lists of Bacterial Names* of 1980. The designated type strains are attached to these validly published names; the names and attached designated type strains (together with biovar reference strains) are presented in Table 1.

The adaptation of *Brucella* taxonomy to the proposal of Verger *et al.* [*Int J Syst Bacteriol* **35** (1985), 292–295], made possible through the 1986 decision of the Subcommittee in Manchester, was a recommended change in taxonomic opinion on genus *Brucella*, whereby the taxonomic opinion of a multispecific genus was abandoned, in favour of a taxonomic opinion of a monospecific genus, based on DNA–DNA hybridization studies alone. As a consequence of this changed classification, the names of the five nomenspecies *Brucella abortus*, *B. suis*, *B. ovis*, *B. neotomae* and *B. canis* were looked upon as heterotypic synonyms of *Brucella melitensis*, resulting in *B. melitensis* as a single species comprising 18 biovars (infrasubspecific taxonomic rank). Changes to the classification of the members of a genus influence the relationship of nomenclature to the *Bacteriological Code*, since one of the prerequisites for valid publication of a bacterial name is designation of a type strain, being of species or subspecies taxonomic rank. However, as a guarantee of a stable nomenclature, a validly published name remains so, and the name is always covered by the Rules of the *Bacteriological Code*, irrespective of taxonomic opinion.

The Subcommittee is referring to well-documented discussions and decisions on the recognition of the six classical *Brucella* nomenspecies as being of species rank within the genus *Brucella*, presented in the minutes of previous meetings of the Subcommittee on the taxonomy of *Brucella* [1962, Montreal, Canada. Stableforth & Jones, *Int Bull Bacteriol Nomencl Taxon* **13** (1963), 145–158, reprinted in *Ann Sclavo* **19** (1977), 151–161; 1966, Moscow, USSR. Jones, *Int J Syst Bacteriol* **17** (1967), 371–375, reprinted in *Ann Sclavo* **19** (1977), 162–166; 1970, Mexico City, Mexico. Jones & Wundt, *Int J Syst Bacteriol* **21** (1971), 126–128, reprinted in *Ann Sclavo* **19** (1977), 167–172; 1974, Tokyo, Japan. Wundt & Brinley-Morgan, *Int J Syst Bacteriol* **25** (1975), 235–236, reprinted in *Ann Sclavo* **19** (1977), 173–176; 1978, Munich, West Germany. Corbel, *Int J Syst Bacteriol* **32** (1982), 260–261; 1982, Boston, MA, USA. Corbel, *Int J Syst Bacteriol* **34** (1984), 366–367; 1986, Manchester, UK. Corbel, *Int J Syst Bacteriol* **38** (1988), 450–452].

At the first official Subcommittee meeting, in Montreal in 1962, species characteristics of the three major species (*B. melitensis*, *B. abortus* and *B. suis*) were defined. At the Moscow meeting in 1966, *B. neotomae* was recommended to constitute a novel species. At the meeting in Mexico City in

Table 1. Species, biovars, type strains and reference strains of the genus *Brucella* Meyer and Shaw 1920

Brucella melitensis (Hughes 1893) Meyer and Shaw 1920 is the nomenclatural type of the genus.

Nomenspecies	Strain designation			Designated as:
	FAO/WHO	NCTC	ATCC	
<i>Brucella melitensis</i> (Hughes 1893) Meyer and Shaw 1920				
Biovar 1	16M	10094	23456	Type and reference
Biovar 2	63/9	10508	23457	Reference
Biovar 3	Ether	10509	23458	Reference
<i>Brucella abortus</i> (Schmidt 1901) Meyer and Shaw 1920				
Biovar 1	544	10093	23448	Type and reference
Biovar 2	86/8/59	10501	23449	Reference
Biovar 3	Tulya	10502	23450	Reference
Biovar 4	292	10503	23451	Reference
Biovar 5	B3196	10504	23452	Reference
Biovar 6	870	10505	23453	Reference
[Biovar 7]	63/75	10506	23454	Potential reference
[Biovar 8]	—	—	—	Deleted in 1978
Biovar 9	C68	10507	23455	Reference
<i>Brucella suis</i> Huddleson 1929				
Biovar 1	1330	10316	23444	Type and reference
Biovar 2	Thomsen	10510	23445	Reference
Biovar 3	686	10511	23446	Reference
Biovar 4	40	11364	23447	Reference
Biovar 5	513	11996	Non-deposit	Reference
<i>Brucella ovnis</i> Buddle 1956	63/290	10512	25840	Type
<i>Brucella neotomae</i> Stoenner and Lackman 1957	5K33	10084	23459	Type
<i>Brucella canis</i> Carmichael and Bruner 1968	RM6/66	10854	23365	Type

1970, *B. ovnis* was recommended to be accepted as a species, and *B. canis* was recommended to be ‘given full species status’ at the meeting in Munich in 1978, having been regarded as still provisional at the 1974 meeting in Tokyo. At all the Subcommittee meetings from 1962 in Montreal up to 1982 in Boston, there were discussions on the *Brucella* biovars and atypical strain variants concerning discriminatory phenotypic behaviour. The meeting of the Subcommittee in Manchester in 1986 was dominated by the issue of the recommended change of taxonomic opinion on members of the genus *Brucella*. Now, looking back 20 years, the strength of the pre-1986 taxonomic opinion on a multi-specific genus *Brucella* has been demonstrated in the intervening years since the 1986 Manchester decision of the Subcommittee; the pre-1986 genus *Brucella* taxonomy has proved to be valuable and thence used.

Through correspondence after the Pamplona meeting, the membership of the *Brucella* Subcommittee has agreed upon the *Brucella* type and reference strains presented in Table 1. Strict regulation of the use of these type and reference strains, including the maintenance of the strains, is fundamental for the stability of *Brucella* taxonomy. It is the intention of the *Brucella* Subcommittee to request an equalized handling of the *Brucella* type and reference strains, including the same pheno-genotypic characterization of these strains (the *Brucella* taxonomy ‘reference points’).

The authenticity of the *B. abortus* biovar 7 reference strain 63/75 has been questioned and will be investigated; until clarification is achieved, this strain will remain as a potential reference strain. *B. abortus* biovar 8 was deleted by the *Brucella* Subcommittee in 1978.

Minute 4. Emendation of criteria for *Brucella* species definition. Potential novel marine mammal *Brucella* species. The Subcommittee will work on amending descriptions of criteria for *Brucella* species definition to cope with the development of refined methods of pheno-genotypic analysis, thus to use pheno-genotypic traits of host preference and virulence pathogenicity (a phylogenetic–evolutionary approach to bacterial species definition), focusing on the potential novel marine mammal *Brucella* species [proposed names ‘*Brucella cetaceae*’ and ‘*Brucella pinnipediae*’; Cloeckart *et al.*, *Microbes Infect* **3** (2001), 729–738]. Much scientific work has been done by Subcommittee members and others during the time since the 1986 Manchester Subcommittee meeting, with the last officially published minutes in 1988 (see above), and since the paper on the proposal for minimal standards for descriptions of new species and biotypes of the genus *Brucella* by Corbel & Brinley-Morgan [*Int J Syst Bacteriol* **25** (1975), 83–89].

With reference to facultatively intracellular bacteria as members of genus *Brucella*, there is a need for a polyphasic

and pragmatic approach to criteria used for bacterial species definition, and several different approaches have been described [Moreno *et al.*, *Vet Microbiol* **90** (2002), 209–227]. The ambition of polyphasic and pragmatic taxonomy is set forth in the reports from the ad hoc committees on reconciliation and approaches to bacterial systematics from 1987, 1990 and 2002 [Wayne *et al.*, *Int J Syst Bacteriol* **37** (1987), 463–464; Murray *et al.*, *Int J Syst Bacteriol* **40** (1990), 213–215; Stackebrandt *et al.*, *Int J Syst Evol Microbiol* **52** (2002), 1043–1047]. Thus, the genomospecies concept provides a basis for bacterial taxonomy, but the DNA–DNA hybridization method is not discriminatory enough to solve all problems of bacterial species delineation. This statement will be in line with the phylogenetic–evolutionary approach to *Brucella* taxonomy, presented in 2002 by E. Moreno, A. Cloeckaert and I. Moriyón [Moreno *et al.*, *Vet Microbiol* **90** (2002), 209–227], where host preference and virulence pathogenicity are important criteria in the delineation of *Brucella* species. Associated with this perspective, the human clinical significance of the three major *Brucella* nomenclatures (*B. melitensis*, *B. abortus* and *B. suis*) and *B. canis* may be emphasized, all of which have a well-known human medical history of their own.

Minute 5. Current membership. The Chairman requested an expansion of the membership, resulting in the following unanimously approved membership list: A. MacMillan (Chairman) (UK), T. Ficht (Secretary) (USA), M. Banai (Israel), A. Cloeckaert (France), J. Godfroid (Belgium), A. López-Merino (Mexico), E. Moreno (Costa Rica) and I. Moriyón (Spain) and the new members D. Ewalt (USA) and B. Osterman (Sweden). M. J. Corbel (UK) has agreed to continue as a corresponding member.

Minute 6. Next meeting. No decision was taken on the next Subcommittee meeting to be convened, but the opportunity to meet during the annual Brucellosis meeting in Chicago was emphasized. There was an agreement on continued discussion via correspondence, with a focus on the presentation of the re-established *Brucella* Subcommittee and the decisions agreed on in Pamplona.

Minute 7. Adjournment. The meeting was adjourned at 13:00 on 17 September 2003.