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MORAXELLA.
THE STANDING IN NOMENCLATURE
OF VARIOUS PROPOSED NAMES

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In a recent paper on Moraxella (Henriksen 1960) the latest (1957) edition of Bergey's Manual was used as the starting point, and no attempt was made to determine whether the names used in the Manual are correct. In connection with this paper the editor of this Bulletin suggested that a re-examination of the early literature on this genus was desirable in order to clarify some obscure points of nomenclature, and to check the correctness of the names now in common use. The present paper is an attempt to do this.

Generic names

Morax (1896), Axenfeld (1897) and Petit (1899) used only vernacular names to designate the organisms described by them. Species now placed in the genus Moraxella were placed in the genus Bacterium by Chester (1897) and by Lehmann and Neumann (1899), and in Bacillus by Eyre (1900). The generic name Bacterium was placed by international agreement in the list of genera rejicienda and by similar agreement the type species of the genus Bacillus was designated as Bacillus subtilis, a rod producing endospores. MacNab (1904) used the generic name Diplobacillus for organisms now placed in Moraxella. This name might well have been legitimate and appropriate were it not for the fact that Weichselbaum (1887) had already used this generic name in a combined generic-species description of an unrelated organism, Diplobacillus brevis endocarditidis. Weichselbaum's paper where this name is proposed includes a description which seems to be quite adequate according to the (Page 231)

standards of those days, although it is insufficient to recognize the organism today. The name given to the species is not "a binary combination consisting of a generic name followed by a single specific epithet" and hence not validly published (Rule 14a(1)). The question next arises whether in a combined genus-species description in which the species name is not validly published the generic name may be validly published. The question next arises whether in a combined genus-species the whole combination is illegitimate, or only the specific epithet, but not the generic name.

In favour of the former alternative it may be said that since only a single species was described, it would be unreasonable to reject the specific epithet and to accept the generic name, since this would leave us with a genus without any validly named species.

In favour of the second alternative it may be said that the validity of publication of generic names is regulated by Rule 13 only, and that the function of Rule 14a is to prevent the introduction of an unacceptable specific epithet or of an illegitimate combination, but not to reject otherwise acceptable generic names. The correct interpretation of Rule 14a in a case like this might be that the specific epithet would have to be changed in order to make the name validly published, whereas there could be no objection to the generic name if combined with an acceptable epithet. A simple way of handling such a difficulty would have been to drop one of the two words in the epithet, as has been done in many similar cases. But since nobody has ever again identified this species, there has been no opportunity to do this. It seems to me that such an interpretation of the rules is reasonable, and that Diplobacillus Weichselbaum should be considered as validly published and Diplobacillus MacNab as a later homonym.

As for Diplobacillus Weichselbaum, organisms belonging to this genus have never again been identified, and Weichselbaum's description is so sketchy that it is highly improbable that such organisms ever will be identified. In view of this it would be reasonable to place the name Diplobacillus Weichselbaum 1887 in the list of nomina rejicienda as a nomen dubium.

In view of the complex nature of this problem it is suggested that this is a matter for the Judicial Commission to consider and that opinions are desirable on the questions

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whether Diplobacillus Weichselbaum 1887 should be rejected as a nomen dubium, and Diplobacillus MacNab 1904 as a later homonym.

Practical considerations speak strongly in favour of such a solution, since Diplobacillus has not been in general use as a generic name for a long time, and considerable confusion might arise from its reintroduction.

No other generic name seems to have been introduced until Holland (1920) proposed the inclusion of these organisms in the genus Haemophilus. This proposal appears to have been reasonable at that time, and no formal objection can be raised against it. In view of what has already been said, it may be the first legitimate generic name used for these organisms.

Lwoff's (1939) proposal to separate these organisms from Haemophilus and to create the new genus Moraxella, was supported by convincing arguments, as he showed that neither morphology nor growth requirements indicated relationship between these organisms and Haemophilus. If the generic name Diplobacillus MacNab is considered as unavailable, no objection can be raised against Lwoff's proposal, and Moraxella Lwoff 1939 consequently is the correct generic name.

Specific epithets

Chester (1897) was the first to propose a formal name, Bacterium conjunctivitis, for the type species. Two objections can be raised against this name. The first, that the epithet was grammatically incorrect (conjunctivitis instead of conjunctivitidis), might have been met by a simple correction. Indeed Chester himself (1901) made the correction in 1901. The second objection is more serious, namely that Chester gave the same name to two different organisms, one being Bacterium conjunctivitis (Morax), and the second, — described on the following page of the same report—being Bacterium conjunctivitis (Koch-Kartulis). The identity of the latter organism is highly questionable. There is little doubt that the bacteria seen by Koch (1883) in secretions from cases of catarrhal conjunctivitis in Egypt, were the organism named Bacillus aegyptius by Trevisan (1889) and now known as Haemophilus aegyptius, which requires both the X- and V-factors. The cultures which Kartulis (1887)

obtained on plain agar from similar cases, must have been some other, unknown organism. Probably the bacteria which grew in his cultures were not the same as he had seen in direct smears of the secretions. It seems, therefore, that the name Bacterium conjunctivitis, as applied to the organism described by Kartulis, and erroneously ascribed to both Koch and Kartulis, should be rejected as a nomen confusum under Rule 24g (Buchanan et al. 1958).

On the other hand Rule 24d states: "When an author simultaneously publishes the same new name for more than one group, the first author who adopts one of them, or substitutes another name for one of them, must be followed." Lehmann and Neumann (1899) were the first to give the Morax-Axenfeld organism another name, Bacterium duplex, and accordingly duplex is a correct specific epithet and remains so, unless some other epithet is conserved. Migula (1900), on the other hand, was first to adopt the name proposed by Chester, although in corrected form, for one of the species, namely Bacterium conjunctivitis (Koch) Migula. Thus the situation with respect to this name is perfectly clear.

Eyre (1900) proposed the name Bacillus lacunatus at a scientific meeting in July, 1898, but the proposal was not validly published until 1900. Furthermore, it has been suggested (Buchanan 1959) that this name is a later homonym of Bacillus lacunatus Wright 1895, and this view appears to be correct. Wright's publication (1895) of the name was valid and it was accompanied by a rather detailed description, although even in this case the species may be unrecognizable today. The fact that the generic name is illegitimate in both cases and that the two organisms apparently were unrelated can probably not alter the conclusion that Bacillus lacunatus Eyre 1900 is a later homonym.

It might be said that this conclusion is unfortunate. The epithet lacunata appears to have been generally accepted and has been used in several editions of Bergey's Manual as well as in most of the recent literature. The adoption of the epithet duplex could cause some confusion. It might, therefore, be a good solution to conserve the epithet lacunata. If lacunata is to be conserved, it will have to be decided whether the epithet should be ascribed to Eyre, who published an illegitimate name, or to Holland, who appears to have been the next author to adopt it, or to both (M. lacunata Holland

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1920 ex Eyre 1900?), or to Lwoff. It seems that the best way to handle these difficulties will be to request an opinion of the Judicial Commission.

The situation is simpler with respect to the other species. Petit's "diplobacille liquefiant" was first given a latin name, Diplobacillus liquefaciens, a literal translation of the name used by Petit, by MacNab (1904). According to the rules, then, the correct name is Moraxella liquefaciens (MacNab 1904) Murray 1948. The epithet duplex proposed by Lwoff (1939) seems to be illegitimate as a later homonym of duplex Lehmann et Neumann 1899.

Scarlett (1916) named the species described by him Bacillus duplex non liquefaciens. Oliver and Wheery (1921) changed this name slightly to Bacterium duplex non-liquefaciens without clearly indicating that they were proposing a new name. These ternary and binary epithets are contrary to the rules. Furthermore, if this organism constitutes a separate species, the epithet duplex is illegitimate. The remaining part of the epithet, nonliquefaciens, however, is acceptable. Apparently this epithet was first used by Murray and Truant (1954) and accordingly the correct name of this species is Moraxella nonliquefaciens (Scarlett 1916) Murray et Truant 1954.

The organism described by Jones and Little (1921) was not named until Hauduroy et al. (1937) proposed the name Haemophilus bovis. The correct name of this species is Moraxella bovis (Hauduroy et al. 1937) Murray 1948.

Finally, if the new sugar-fermenting organism described by Flamm is confirmed to be a Moraxella species, its correct name is Moraxella saccharolytica Flamm 1956.

Conclusions

It is proposed that the generic name Diplobacillus MacNab 1904 should be considered as a later homonym of Diplobacillus Weichselbaum 1887. If this proposal is accepted, Moraxella Lwoff 1939 is the correct generic name, and the correct names of the species are the following:

1. Moraxella duplex (Lehmann et Neumann 1899)
2. Moraxella liquefaciens (MacNab 1904) Murray 1948
3. Moraxella nonliquefaciens (Scarlett 1916) Murray et Truant 1954

4. Moraxella bovis (Hauduroy et al. 1937) Murray 1948
5. Moraxella saccharolytica Flamm 1956

Opinions of the Judicial Commission are requested on these questions:

- I. Should a generic name proposed in a combined description of a genus and a species in a monotypic genus be regarded as validly published if the name of the single species described was not validly published?
- II. Should the generic name Moraxella Lwoff be conserved against Diplobacillus MacNab?

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