Why are so many effectively published names of prokaryotic taxa never validated?

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Abstract

Nearly half of the new names of prokaryotic taxa between the ranks of subspecies and class that were effectively published in journals other than the International Journal of Systematic and Evolutionary Microbiology (IJSEM) in the period 2014–2017 were never submitted for validation. A survey of such effectively published names that include information on the etymology of the name, a description of the taxon, and for species and subspecies generally at least one culture collection deposit, shows that for more than 150 such effectively published names per year on average, validation was never requested. To prevent further accumulation in the literature of names of prokaryotic taxa without standing in the nomenclature, we call upon authors of taxon descriptions and on the editors of the journals handling such papers to be more aware of the duty to validate effectively published names.

The International Code of Nomenclature of Prokaryotes (the Prokaryotic Code) [1] describes two kinds of publication of names of taxa of prokaryotes: effective publication and valid publication. These are regulated by Rules 25, 27 and 30:

Rule 25a: Effective publication is effected under this Code by making generally available, by sale or distribution, to the scientific community, printed and/or electronic material for the purpose of providing a permanent record.

Note. Electronic publication should follow the tradition of publication of printed matter acceptable to this Code.

Rule 25b lists different kinds of publication that are not accepted as effective publication.

Rule 27: A name of a new taxon, or a new combination for an existing taxon, is not validly published unless the following criteria are met.

(1) The name is published in the IJSB/IJSEM.
(2) The publication of the name in the IJSB/IJSEM is accompanied by a description of the taxon or by a reference to a previous effectively published description of the taxon ... As of 1 January 2001 the following criteria also apply: …
   (a) The new name or new combination should be clearly stated and indicated as such (i.e. fam. nov., gen. nov., sp. nov., comb. nov., etc.).
   (b) The derivation (etymology) of a new name (and if necessary of a new combination) must be given.
   (c) The properties of the taxon being described must be given directly after (a) and (b). This may include reference to tables or figures in the same publication, or reference to previously effectively published work.
   (d) All information contained in (c) should be accessible.
(3) The type of the taxon must be designated… In the case of species or subspecies including new combinations, the type strains must be deposited according to Rule 30.

Note. Valid publication of the name of a taxon requires publication in the IJSB/IJSEM of the name of the taxon and reference to an effectively published description whether in the IJSB/IJSEM or in another publication. The date of valid publication is that of publication in the IJSB/IJSEM. The name may be mentioned in a previously published description, but the name is not validly published until its publication in the IJSB/IJSEM. If the initial proposal of the new name or new combination is not effectively published in the IJSB/IJSEM, valid publication (announcement in a Validation List) of the name in the IJSB/IJSEM is primarily the responsibility of the author of the name or combination together with the requirements of Rule 27(2) and (3) above.

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However, other individuals may also submit a new name or new combination for valid publication provided it conforms to the Rules of this Code.

Rule 30: For the name of a species to be validly published, it must conform with the following conditions.

1. It must be published in conformity with Rules 27 and 28b.
2. It must be published as a binary combination consisting of a genus name followed by a single species epithet (…).
3. (b) As of 1 January 2001, the description of a new species, or new combinations previously represented by viable cultures must include the designation of a type strain, and a viable culture of that strain must be deposited in at least two publicly accessible culture collections in different countries from which subcultures must be available. The designations allotted to the strain by the culture collections should be quoted in the published description. Evidence must be presented that the cultures are present, viable, and available at the time of publication.
4. Organisms deposited in such a fashion that access is restricted, such as safe deposits or strains deposited solely for current patent purposes, may not serve as type strains.

Based on these rules, names of taxa effectively but not validly published have no standing in the nomenclature. Effective publication of names in publications other than the IJSEM must therefore be followed by valid publication. Also publication of names in the IJSB/IJSEM does not automatically constitute valid publication, as each name must conform to the Rules of the Code. In a paper published in 2006 [2], Tindall et al. provided a detailed overview how the validation procedure works. To obtain standing in the nomenclature, requests for validation of effectively published names must be submitted to the IJSEM editorial office. The List Editors then check whether the names meet all the criteria determined in the Rules of the Prokaryotic Code, acting on the advice of experts associated with the IJSEM/ICSP, and they prepare Validation Lists – lists of new names and new combinations previously effectively, but not validly, published. These lists are published bimonthly in the IJSEM.

It should be the aim of all authors who effectively publish names of new prokaryotic taxa that those names will obtain standing in the nomenclature. However, the reality is very different, as the statistics for the years 2014–2017 show. Table 1 presents data about the numbers of new names of taxa (between subspecies and class – the categories covered by the Rules of the Code) effectively published in seven major journals that routinely publish descriptions of new taxa and contribute most of the names submitted for validation in IJSEM. The survey included descriptions that included the proposed name of the taxon, information on the etymology of the name, a description of the properties of the taxon, and for species and subspecies generally at least one culture collection deposit. Out of the 1380 names only 774 (56.1%) were submitted for validation, of which 730 (52.9%) were approved for inclusion in the Validation Lists. The majority of names submitted for validation were effectively published in those seven journals. The total number of names published in the years 2014–2017 for which validation was requested was 1118; the remaining 344 names were effectively published in 44 other journals, most of which do not routinely publish descriptions of new prokaryotic taxa (Table 2). The large number of names (165) from Frontiers in Microbiology, Frontiers in Genetics and Nature Microbiology came from a small number of papers proposing extensive rearrangements of a number of higher taxa, with the establishment of many new combinations of names. For comparison, the total number of validly published names for the period 2014–2016 (i.e., the first 3 years of our 4-year survey) was 3586 [3].

The most frequent reason for non-approval of validation is culture collection numbers given in the taxon description not matching the number on the culture collection documents. Other frequent reasons included (1) malformation of names that the List Editors are not authorized to correct without a corrigendum by the authors; (2) lack of a clear description of the taxon; (3) no nomenclatural type being designated; (4) deposition in one culture collection only. Less frequent reasons for non-approval included (1) restrictions on availability from culture collections, e.g. patent deposits, safe deposits, or otherwise problematic culture collection documents; (2) proposing a genus name that already exists in botany or zoology; (3) proposing to validate species names for a genus name that has no standing in the nomenclature; (4) requesting validation of names that include a change in rank; (5) proposing a higher taxon that includes a type taxon having an illegitimate name.

Based on Note 1 to Rule 27, valid publication of name in the IJSB/IJSEM is primarily the responsibility of the author of the name or combination. Unfortunately, not all authors appear to be aware of the need to validate names after they have been effectively published outside the IJSEM. Editors of some journals routinely remind authors of taxon description papers of the need to submit the names for valid publication after the paper in which those names featured had been published, in final form, in their journals. As a result, 82, 78 and 76% of the names effectively published in 2014–2017 in Systematic and Applied Microbiology, Antonie van Leeuwenhoek and Standards in Genomic Sciences, respectively, were submitted for validation; 75, 76 and 74% were approved, respectively. However, for the other journals listed in Table 1 the values were between 5 and 50% (between 2 and 45% approved).

Processing of validation requests by the IJSEM List Editors often results in the correction of minor typographical or orthographic errors in the effectively published names. Some journals that publish descriptions of new taxa have a good quality-control mechanism to ensure that the names
published meet the requirements of the Code and its orthography appendix (Appendix 9). But review by nomenclature experts is poor or altogether absent in most journals.

In cases where a correction is possible, the options for the List Editors to correct names are limited by Rule 61 of the Code. The abbreviation ‘corrig.’ (corrigendum) is then
Table 2. Numbers of names of new taxa (subspecies to class) effectively published in 2014–2017 in journals not listed in Table 1, submitted (by 1 May 2018) and approved for validation

<table>
<thead>
<tr>
<th>Journal</th>
<th>Number of names of taxa for which validation was requested</th>
<th>Names approved for validation</th>
<th>Percent of requests approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontiers in Microbiology</td>
<td>82</td>
<td>81</td>
<td>99</td>
</tr>
<tr>
<td>Frontiers in Genetics</td>
<td>51</td>
<td>51</td>
<td>100</td>
</tr>
<tr>
<td>Nature Microbiology</td>
<td>32</td>
<td>26</td>
<td>81</td>
</tr>
<tr>
<td>Extremophiles</td>
<td>19</td>
<td>19</td>
<td>100</td>
</tr>
<tr>
<td>Journal of Antibiotics</td>
<td>19</td>
<td>16</td>
<td>84</td>
</tr>
<tr>
<td>Anaerobe</td>
<td>16</td>
<td>12</td>
<td>75</td>
</tr>
<tr>
<td>Environmental Microbiology</td>
<td>15</td>
<td>15</td>
<td>100</td>
</tr>
<tr>
<td>PLoS One</td>
<td>14</td>
<td>11</td>
<td>79</td>
</tr>
<tr>
<td>Journal of General and Applied Microbiology</td>
<td>13</td>
<td>10</td>
<td>77</td>
</tr>
<tr>
<td>Applied and Environmental Microbiology</td>
<td>8</td>
<td>6</td>
<td>75</td>
</tr>
<tr>
<td>ISME Journal</td>
<td>7</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>Microbiology (Russia)</td>
<td>7</td>
<td>3</td>
<td>43</td>
</tr>
<tr>
<td>Annals of Microbiology; Infections, Genetics and Evolution; Geomicrobiology Journal; Microbiology and Immunology</td>
<td>16 (4 each)</td>
<td>16 (4 each)</td>
<td>100</td>
</tr>
<tr>
<td>Journal of Clinical Microbiology</td>
<td>4</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>BMC Microbiology; Aquaculture</td>
<td>6 (3 each)</td>
<td>6 (3 each)</td>
<td>100</td>
</tr>
<tr>
<td>BMC Genomics; FEMS Microbiology Letters; Infection and Immunity; Microbes and Environments; Microbiology China</td>
<td>10 (2 each)</td>
<td>10 (2 each)</td>
<td>100</td>
</tr>
<tr>
<td>3 Biotech; Emerging Microbes and Infections; Journal of Basic Microbiology; Pakistan Journal of Agricultural Sciences</td>
<td>8 (2 each)</td>
<td>4 (1 each)</td>
<td>50</td>
</tr>
<tr>
<td>Journal of Microbiology and Biotechnology</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>BioMed Research International; Carcinogens; Diagnostic Microbiology and Infectious Disease; FEMS Microbiology Ecology; International Journal of Agricultural Biology; International Journal of Medical Microbiology; Journal of Phylogenetic and Evolutionary Biology; Journal of Medical Microbiology; Journal of Microbiology and Biotechnology; Microbial Ecology in Health and Disease; Microbiology Open; Research in Microbiology; Scientific Reports</td>
<td>13 (1 each)</td>
<td>13 (1 each)</td>
<td>100</td>
</tr>
<tr>
<td>Applied Biochemistry and Biotechnology; Vector-Borne and Zoonotic Diseases</td>
<td>2 (1 each)</td>
<td>0 (1 each)</td>
<td>0 (1 each)</td>
</tr>
<tr>
<td>Total</td>
<td>344</td>
<td>308</td>
<td>90</td>
</tr>
</tbody>
</table>

appended to the name in the Validation List. In case of major problems with malformed names that were effectively published, the authors are requested to publish a corrigendum before the name can be resubmitted for validation. Frequently encountered errors that can be corrected by the List Editors are lack of agreement of the gender of adjectives used as specific epithets with the generic names [Rule 12 c (1)] and incorrect connecting vowels in compound names [Appendix 9 – A(1)(b)]. Nomenclature-related corrections and comments are added in footnotes to the Validation Lists. As a recent example shows [4], the additional nomenclature quality control during the processing of validation requests corrects many effectively published names and/or their etymologies.

Based on the data presented in Table 1, there are at least 606 effectively published names from the 4 years of our survey for which validation was never requested, so more than 150 per year on average. This is high compared to the nearly 1300 validly published names of prokaryote taxa published annually in recent years, and is also likely an underestimate – it is based on a survey of only seven journals, and no record exists on the number of additional names effectively published in other journals that were not submitted for validation.

To prevent further accumulation in the literature of names of prokaryotic taxa without standing in the nomenclature, we call upon authors of taxon descriptions and on the editors of the journals handling such papers to be aware of the need to validate effectively published names. Creating useless names that will never obtain standing in the nomenclature only causes unnecessary confusion in the literature, and could eventually lead back to the scenario that existed before the Approved Lists [5] were published – this would be highly undesirable. Effective publication is only the first stage. As clarified by Note 1 to Rule 27, anyone may submit effectively published names or new combinations for valid publication, not only the authors of the original publications. The procedure is simple: all that is needed is to submit to the IJSEM editorial office an electronic copy of the final published version in which the names were effectively published and (for species and subspecies) documentation that the type strains are available.
from two culture collections in accordance with the requirements of Rule 30 of the Code. The editorial office staff and the List Editors will further process the requests.

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Conflicts of interest
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References

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