

The use of Greek and Latin prepositions and prefixes in compound names: proposed emendation of Appendix 9 of the International Code of Nomenclature of Prokaryotes

Aharon Oren,^{1,*} Maria Chuvochina² and Bernhard Schink³

Abstract

Part A of Appendix 9 – Orthography of the International Code of Nomenclature of Prokaryotes regulates the formation of compound generic names and specific epithets derived by combining two or more words or word elements of Latin and/or Greek origin, using the word stems and connecting vowels (-o- or -i-) following word elements derived from Greek and Latin, respectively. The rules given and the exceptions listed are suitable for substantives (nouns) and adjectives used as word elements, but not for prepositions and prefixes. Therefore, we propose a non-retroactive modification of Appendix 9 so that the guidelines given in Part A apply only to compound names that include a noun or an adjective in a non-final position. We also propose guidelines for the proper use of Greek and Latin prepositions, prefixes and adverbs in compound names in which the following word element starts with a vowel.

Section A of Appendix 9 – Orthography of the International Code of Nomenclature of Prokaryotes (ICNP) [1, 2] regulates the way compound generic names and specific epithets are formed. The combination of word elements follows four basic rules:

- (a) Except for the last word element only the word stems are to be used.
- (b) The connecting vowel is -o- when the preceding word element is of Greek origin, it is -i- when the preceding word element is of Latin origin ...
- (c) A connecting vowel is dropped when the following word element starts with a vowel.
- (d) Hyphens and diacritic signs are not allowed ...

Exemptions from these regulations exist only for the following cases:

- (a) When well-established word elements from chemistry or physics are used, their use in these sciences must be followed ...
- (b) As in inorganic chemistry the vowels -o and -i are used to indicate different oxidation levels of cations (e.g. ferro, ferri, cupro, cupri, etc.) they do not fall under the Greek/Latin ruling for connection vowels when used in prokaryote names ...

(c) In word components like bio-, geo-, halo-, neo-, macro-, micro-, etc., the connecting vowel -o- may be kept when a component follows that begins with a vowel (for reasons of clarity or of previous usage).

The above rules and the exceptions listed are suitable for substantives (nouns) and adjectives used as word elements, but not for prepositions and prefixes. Strict adherence to the current rules would lead to names such as '*Parococcus*' instead of '*Paracoccus*', '*Metoscardovia*' instead of '*Metascardovia*', '*Actinopolospora*' instead of '*Actinopolyspora*', etc., if such names were introduced as new names today based on the guidelines of Appendix 9.

The rules and guidelines of the International Code of Nomenclature for algae, fungi, and plants [3] are more suitable for the use of prepositions and prefixes in compound names. Based on Recommendation 60G.1, a name or epithet that combines elements derived from two or more Greek or Latin words should be formed, as far as practicable, in accordance with classical usage. The rules for connecting vowels presented in Article 60(10), which applies to specific epithets, refer only to cases in which a noun or adjective in a non-final position appears as a compounding form. We suggest adopting similar recommendations in Appendix 9 of the ICNP, and present here a proposal for dealing with prepositions, prefixes and adverbs from Greek and Latin origin when used in compound generic names and specific epithets.

Author affiliations: ¹The Institute of Life Sciences, The Hebrew University of Jerusalem, The Edmond J. Safra Campus, 9190401 Jerusalem, Israel; ²Australian Centre for Ecogenomics, University of Queensland, St. Lucia QLD 4072, Brisbane, Australia; ³Department of Biology, University of Konstanz, D-78457 Constance, Germany.

*Correspondence: Aharon Oren, aharon.oren@mail.huji.ac.il

Keywords: International Code of Nomenclature of Prokaryotes; orthography; compound names; prefixes; prepositions; connecting vowels.

Many Greek prepositions and prefixes are found in generic names and specific epithets of prokaryotes. These are not followed by a connecting vowel. Examples are *Metakosakonia*, *Paracoccus*, *Salmonella paratyphi*, etc. Many such words end in a vowel: *amphi* (around, about, near), *ana* (up, through, upon), *anti* (opposite, instead of), *apo* (from), *dia* (through, because of), *epi* (against, besides, about, on), *hypo* (under), *kata* (down, along), *meta* (besides, between, next to, after), *para* (to, near, beside, from), *peri* (around, near, above), and *pro* (before, in front of). Note that in Greek the meaning of a preposition can depend on the grammatical case of what follows (genitive, dative, or accusative) [4].

When Greek prepositions and prefixes that end in a vowel are attached to word elements that begin with a vowel, the final vowel is generally elided according to the rules of Greek grammar. This was implemented in many cases, e.g. in the generic names *Eperythrozoon*, *Paralcaligenes*, *Parendozoicomonas*, *Paralkalibacillus*, *Parolsenella* and in the specific epithets of *Bacillus paranthracis*, *Haemophilus paraphrophilus*, *Haemophilus paraphrohaemolyticus* and *Vibrio metoecus*. However, in the names *Paraeggerthella*, *Paraorskovia*, *Microbulbifer epialgicus*, *Keratinibaculum paraultunense*, and *Streptococcus parauberis* the final vowel was not elided. The final vowels of the prepositions or prefixes *peri* and *pro* do not elide, nor do prepositions formed from Greek adjectives such as *poly* and *mega* (examples: *Fusobacterium periodonticum*, *Polyangium*, *Clostridium polyendosporum*).

Latin prepositions and prefixes such as *ante*, *contra*, *extra*, *infra*, *intra*, *pro*, *supra*, and *ultra* are not followed by a connecting vowel. When Latin prepositions and prefixes that end in a vowel are attached to word elements that begin with a vowel, the final vowel is not elided conforming to the usage in classical Latin.

Latin adverbs are rarely used in compound names of prokaryotes. A notable exception is *paene*, found in many compound names. Here the -i- as connecting vowel was used in generic names such as *Paenibacillus*, *Paeniclostridium*, and *Paenisporosarcina*. The connecting vowel is dropped when the following word element starts with a vowel, such as it occurs in *Paenalcaligenes*, *Paenarthrobacter*, and *Paenochrobactrum*. We do not encourage more extensive use of adverbs in compound names.

Here we therefore propose the following changes to Appendix 9:

A. Formation of Compound Names

(1) Compound names are formed by combining two or more words or word elements of Latin and/or Greek origin into one generic name or specific epithet. In most cases two word elements are used (e.g. Thio/bacillus, thio/parus), but up to four elements may be found (e.g. Ecto/thio/rhodo/spira). A name or epithet that combines elements derived from two or more Greek or Latin words should be formed,

as far as practicable, in accordance with classical usage. The combination of word elements follows four basic rules:

- (a) Except for the last word element only the word stems are to be used.
- (b) For compound names that contain a noun or adjective in a non-final position the connecting vowel is -o- if the preceding word element is of Greek origin, it is -i- if the preceding word element is of Latin origin ...

Below paragraph (2) ('Exemptions from these regulations exist ...') we propose adding the paragraph:

- (3) Greek prepositions and prefixes are not followed by a connecting vowel.

Examples: *Metakosakonia*, *Paracoccus*.

When Greek prepositions and prefixes that end in a vowel (e.g. *epi*, *kata*, *meta*, *para*) are attached to word elements that begin with a vowel, the final vowel is elided.

Examples: *Eperythrozoon*, *Paralcaligenes*, *Parendozoicomonas*, *Vibrio metoecus*. Exceptions are the prepositions *peri* and *pro*, which do not elide.

Example: *Fusobacterium periodonticum*.

Prepositions formed from Greek adjectives (e.g. *poly*, *mega*) and adverbs such as *exo* and *eu* also do not elide.

Examples: *Polyangium*, *Clostridium polyendosporum*.

Latin prepositions and prefixes are not followed by a connecting vowel. When Latin prepositions and prefixes that end in a vowel are attached to word elements that begin with a vowel, the final vowel is not elided conforming to the usage in classical Latin.

Adverbs are rarely used in compound words, and more extensive use is not encouraged. For Latin adverbs the connecting vowel -i- may be used; it is dropped if the following word element starts with a vowel.

Examples: *Paenibacillus*, *Paenalcaligenes*.

Funding information

M. C. was supported by the Australian Research Council Laureate Fellowship (FL150100038).

Conflicts of interest

The authors declare that there are no conflicts of interest.

References

1. Parker CT, Tindall BJ, Garrity GM. International code of nomenclature of prokaryotes. prokaryotic code (2008 revision). *Int J Syst Evol Microbiol* 2019;69:S1–S111.
2. Trüper HG, Euzéby JP. International code of nomenclature of prokaryotes. Appendix 9: Orthography. *Int J Syst Evol Microbiol* 2009; 59:2107–2113.
3. Turland NJ, Wiersema JH, Barrie FR, Greuter W et al.(editors) . *International Code of Nomenclature for Algae, Fungi and Plants (Shenzhen Code) Adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017*, Regnum Vegetabile 159. Glashütten: Glashütten Koeltz Botanical Books; 2018.
4. Goodwin WW. *A Greek Grammar*. Boston: Ginn & Company; 1900.