IUPAC-IUB Commission on Biochemical Nomenclature

Tentative Rules

The former IUPAC Commission on the Nomenclature of Biological Chemistry prepared the Definitive Rules for the Nomenclature of Vitamins, which were published in the Journal of the American Chemical Society, 82, 5581 (1960), Rules V-1 to V-15. The IUPAC-IUB Commission on Biochemical Nomenclature (CBN) recently undertook the revision of these Rules together with discussion of some related topics. Some vitamins belong to classes of organic compounds, the nomenclature of which has been considered systematically elsewhere; for these vitamins the trivial names are given together with the systematic names in the appropriate Rules. Naphthoquinones, previously defined by Rule V-4, are now considered under the Nomenclature of Quinones with Isoprenoid Side Chains (page 2989). Rule V-11, dealing with cyclohexitols, is under consideration within the wider question of the Nomenclature of Cyclitols. Rule V-13, relating to folic acid, has been replaced by the Nomenclature and Symbols for Folic Acid and Related Compounds (page 2991).

Rule V-15 reproduced with slight changes the Tentative Rules for Nomenclature in the Vitamin B12 Field, issued by the IUPAC Commission on the Nomenclature of Organic Chemistry in the IUPAC “Blue Book” of 1957; it is now replaced by the Nomenclature of Corrinoids (page 2992). Rules V-9, V-10, V-12, and V-14, for compounds whose nomenclature has never been controversial, are now omitted.

The remaining Rules, in some cases revised, are brought together in Trivial Names of Miscellaneous Compounds of Importance in Biochemistry, which follows.

Trivial Names of Miscellaneous Compounds of Importance in Biochemistry

M-1 (Replacing V-1)

1.1 Compound I (R = -CH2OH), 2,6,6-trimethyl-1-(9'-hydroxy-3',7'-dimethylnona-1',3',5',7'-tetraenyl)cyclohex-1-ene, also known as vitamin A, vitamin A alcohol, vitamin A1, vitamin A1 alcohol, or axerophthol, should be designated retinol.

1.2 Compound I (R = -CHO), also known as vitamin A (A1) aldehyde or retinene, should be designated retinal or retinaldehyde.

1.3 Compound I (R = -COOH), also known as vitamin A (A1) acid, should be designated retinoic acid.

M-2 (Replacing V-2)

2.1 Compound III (R = -C-C=C--C--C--Me2), 9,10-secoergosta-5,7,10(19),22-tetraen-33-ol, also known as vitamin D2 or calciferol, should be designated ergocalciferol.

2.2 Compound II (R = -CH3), 2,6,6-trimethyl-1-(9'-hydroxy-3',7'-dimethylnona-1',3',5',7'-tetraenyl)cyclohex-1-ene, also known as vitamin A, vitamin A alcohol, vitamin A1, vitamin A1 alcohol, or axerophthol, should be designated retinol.

2.3 Compound II (R = -CHO), also known as vitamin A (A1) aldehyde or retinene, should be designated retinal or retinaldehyde.

2.4 Compound II (R = -COOH), also known as vitamin A (A1) acid, should be designated retinoic acid.
Trivial Names of Miscellaneous Compounds

2.2 Compound III (R = C—CH₂—CH₂—CH₃—C—Me₂), 9,10-secocholesta-5,7,10(19)-trien-3β-ol, also known as vitamin D₃, should be designated cholecalciferol.

M-3 (Replacing V-3)

3.1 Compound IV (R₁ = R₂ = R₃ = —H), 2-methyl-2-(4',8',12'-trimethyltridecyl)chroman-6-ol, should be designated tocol.

3.2 Compound IV (R₁ = R₂ = R₃ = -Me), known as vitamin E or α-tocopherol, should be designated α-tocopherol or 5,7,8-trimethyltocol.

3.3 Compound IV (R₁ = R = R₂ = -H), known as vitamin E or α-tocopherol, should be designated α-tocopherol or 5,7,8-trimethyltocol.

3.4 Compound IV (R₁ = —H; R₂ = R₃ = —Me), known as γ-tocopherol, should be designated γ-tocopherol or 7,8-dimethyltocol.

3.5 Compound IV (R₁ = R₂ = —H; R₃ = —Me), known as δ-tocopherol, should be designated δ-tocopherol or 8-methyltocotrienol.

3.6 Compound V (R₁ = R₂ = R₃ = —H), 2-methyl-2-(4',8',12'-trimethyltrideca-3',7',11'-triencyl)chroman-6-ol, should be designated toco-trienol.

3.7 Compound V (R₁ = R₂ = R₃ = —Me), also known as natural (+)-α-tocopherol, should be designated α-tocotrienol or 5,7,8-trimethyltocotrienol, or tocochromanol-3.⁴

3.8 Compound V (R₁ = R₂ = —Me; R₃ = —H), also known as α-tocopherol, should be designated β-tocotrienol or 5,8-dimethyltocotrienol.

3.9 Compound V (R₁ = —H; R₂ = R₃ = —Me), also known as γ-tocopherol, should be designated γ-tocotrienol, 7,8-dimethyltocotrienol, or plastochromanol-3.⁴

3.10 Compound V (R₁ = R₂ = —H; R₃ = —Me) should be designated δ-tocotrienol or 8-methyltocotrienol.

⁴ Natural (+)-α-tocopherol has the 2R, 4'R, 8'R configuration according to the convention of R. S. Cahn, C. K. Ingold, and V. Prelog (Experientia, 12, 81 (1956)). The designation of other stereoisomers is under consideration.

4 See Nomenclature of Quinones with Isoprenoid Side Chains, paragraph 3.3.2.

M-5 (Replacing V-5)

The cation VI, 3-(4-amino-2-methylpyrimidin-5-ylmethyl)-5-(2-hydroxyethyl)-4-methylthiazolium, also known as vitamin B₆, aneurin(e), or thiamine, should be designated thiamin.

M-6 (Replacing V-6)

Compound VII, 7,8-dimethyl-10-(1'-α-ribityl)isoalloxazine, also known as vitamin B₂, lactoflavine(e), or riboflavin, should be designated riboflavin.

M-7 (Replacing V-7)

7.1 Compound VIII (R = —COOH), pyridine-3-carboxylic acid, also known as niacin, should be designated nicotinic acid.

7.2 Compound VIII (R = —CONH₂), also known as niacinamide, should be designated nicotinamide.

M-8 (Replacing V-8)

8.1 Compound IX (R = —COOH), pyridine-3-carboxylic acid, also known as niacin, should be designated nicotinic acid.

8.2 Compound IX (R = —CONH₂), also known as niacinamide, should be designated nicotinamide.

M-16 (Replacing V-16)

Compound X, 2,3-didehydro-l-threo-hexono-1,4-lactone, also known as vitamin C, should be designated L-ascorbic acid or ascorbic acid.
**Nomenclature of Quinones with Isoprenoid Side Chains**

1. **INTRODUCTION**

At its meeting in Amsterdam on April 17-18, 1961, the IUPAC Commission for the Nomenclature of Biological Chemistry appointed a Subcommittee, consisting of K. Folkers, D. E. Green, O. Isler, C. Martius, R. A. Morton, and E. C. Slater, to report on the standardization of the nomenclature of the quinones with an isoprenoid side chain. The Subcommittee met once at Zürich on April 28-29, 1963, and otherwise carried out its activities by correspondence. On June 13, 1964, it reported to the IUPAC-IUB Commission on biochemical nomenclature, which adopted the report, with minor modifications, at its meeting in Anif, Austria, on September 23-25, 1964.

2. **THE PROBLEM**

The following groups of quinones with isoprenoid side chains have been described:

1. The compound 2-methyl-3-phytyl-1,4-naphthoquinone, generally called vitamin K₁ or phylloquinone (I).
2. The compounds 2-methyl-3-multiprenyl-1,4-naphthoquinone, generally known as vitamin K₂ (5ₙ), where n is the number of isoprenoid units in the side chain (II).
3. The compounds 2,3-dimethoxy-5-methyl-6-multiprenyl-1,4-benzoquinone, known as coenzyme Qₙ or ubiquinone(5ₙ), where n is the number of isoprenoid units in the side chain (III).
4. The compound 2,3-dimethyl-6-nonaprenyl-1,4-benzoquinone, named Kofler's quinone or plastoquinone (IV).
5. The compounds named tocopherylquinones, formed by the oxidation of the tocopherols (methyltoccols) by AuCl₃ or FeCl₃ (V).
6. The compound 2,3,5-trimethyl-6-decaprenyl-1,4-benzoquinone (VI), which has been referred to as vitamin E₂ (5₀).
7. Coenzymes Q or ubiquinones containing a partially saturated side chain.

The close chemical relationship among these compounds, obvious by inspection of Formulas I through VI, is not reflected in the various nomenclatures used. Lower subscripts have been used (a) as a series number (e.g. vitamin K₂), (b) to indicate the number of isoprene units (e.g. Q₂), (c) in vitamin E₂ to indicate that the side chain is the same as in vitamin K₁.

These compounds possess two types of side chain: (a) phytyl (I) or derived phytyl (V), (b) polyprenyl (II, III, IV, VI); and three types of quinone: (a) 1,4-naphthoquinone (I, II), (b) methyl- and methoxy-substituted 1,4-benzoquinone (III), (c) methyl-substituted 1,4-benzoquinone (IV, V, VI).

On reduction the quinones yield the hydroquinones. An isomer of the quinone and an isomer of the hydroquinone, both formed by ring closure, are also known. The former has been named a chromenol, the latter chromanol. The interrelationship between quinones, chromenols, hydroquinones, and chromanols is as follows:

\[
\begin{align*}
\text{Quinone} & \quad \text{+2H} \quad \text{→} \quad \text{Hydroquinone} \\
\text{Chromenol} & \quad \text{+H₂O} \quad \text{→} \quad \text{Chromanol}
\end{align*}
\]

The Committee decided to limit its task to naturally occurring

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*See paragraph 3.1.2.*

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*These Tentative Rules replace Rule V-4 of the Rules for the Nomenclature of Vitamins (see Introduction, page 2987) and have been published in IUPAC Information Bulletin No. 25, February 1966, page 24, and in *Biochimica et Biophysica Acta*, 107, 5 (1965).*
The abbreviations for tocopherol, tocopherolquinone, and tocotrienol are, respectively, T, TQ, and T-3. Each is to be prefixed with the appropriate Greek letter (see Rule M-3); thus, for example:

\[ \alpha\text{-Tocopherol} \]
\[ \beta\text{-Tocopherolquinone} \]
\[ \gamma\text{-Tocotrienol} \]

3.2.6 It is realized that menaquinone has sometimes been used in the past to designate the parent quinone, 2-methyl-1,4-naphthoquinone (menadione).

3.2.7 The stem derived by omitting “quinone” should be used to describe the corresponding hydroquinone, chromanol, and chroman. In the trivial name, “quinol” should be used instead of “hydroquinone.” Thus the four compounds with 2,3-dimethoxy-5-methylbenzoquinone as nucleus should be designated: ubiquinone, ubiquinol, ubichromanol, and ubichromenol.

3.2.8 The hydroquinones may be abbreviated by the addition of H₂ to the abbreviation of the quinone. If an abbreviation of a chromanol or chromenol is required, it is suggested that the suffixes \( \text{al} \) and \( \text{el} \), respectively, be added to the abbreviation of the quinone.

3.3 Designation of Individual Members of Each Group

3.3.1 The IUPAC-IUB Commission on Biochemical Nomenclature recognizes that there are two schools of thought concerning the designation of the individual members of each group of quinones. One school considers that the links with vitamin E, coenzyme Q, and vitamin K are retained sufficiently by the name tocoquinone and by the abbreviations Q and K (or MK), and proposes that the different members should be designated: \( \text{ubiquinone, ubiquinol, ubichromanol, and ubichromenol} \).

3.3.2 The designations of the individual members of each group, \( n \), are decided by the presence of the suffix \( \text{al} \) or \( \text{el} \). The suffix \( \text{al} \) is added to the abbreviation of quinones if the members are \( n \), as in the present practice in the coenzyme Q series. Table II summarizes the two proposals.

Supporters of Proposal I consider that the use of lower subscript numbers in this series is undesirable since they have been used to designate the different vitamins. Moreover, they are opposed to the use of “E” in the names of compounds that do not have vitamin E activity.

Supporters of Proposal II consider that it is fair and proper to recognize the key significance of discoveries in the coenzyme Q field by designating the compound in question as ubiquinone Qₙ.

### Table I

<table>
<thead>
<tr>
<th>Quinoid nucleus</th>
<th>Side chain</th>
<th>First part of name</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,3,5-Trimethylbenzoquinone</td>
<td>Multiprenyl</td>
<td>Tocoquinone</td>
<td>PQ</td>
</tr>
<tr>
<td>2,3-Dimethylenzobenzquinone</td>
<td>Multiprenyl</td>
<td>Plastoquinone</td>
<td>Q</td>
</tr>
<tr>
<td>2,3-Dimethoxy-5-methylbenzoquinone</td>
<td>Multiprenyl</td>
<td>Ubiquinone</td>
<td>MQ</td>
</tr>
<tr>
<td>2-Methylphthaloquinone</td>
<td>Multiprenyl</td>
<td>Phytol</td>
<td>QK</td>
</tr>
</tbody>
</table>

### Table II

<table>
<thead>
<tr>
<th>Proposal I</th>
<th>Proposal II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Abbreviation</td>
</tr>
<tr>
<td>Tocoquinone-ₙ</td>
<td>PQ-ₙ</td>
</tr>
<tr>
<td>Plastoquinone-ₙ</td>
<td>Qₙ</td>
</tr>
<tr>
<td>Ubiquinone-ₙ</td>
<td>Kₙ</td>
</tr>
<tr>
<td>Menaquinone-ₙ</td>
<td>MKₙ</td>
</tr>
<tr>
<td>Phylloquinone</td>
<td>K</td>
</tr>
</tbody>
</table>

### Footnotes

1. Prenyl is 3-methylbut-2-en-1-yl (IUPAC Organic Rule A-3.5).
The Commission strongly prefers Proposal I, but, in recognition of the fact that Proposal II is supported by a number of active workers in the field, resolved to accept Proposal II as an alternative, less desirable form.

In many cases, α may be omitted from the abbreviation, especially in chemical equations.

3.3.2 According to these recommendations, α-tocotrienol (5,7,8-trimethyltocotrienol, also known as γ-tocopherol) may be designated tocopherol-3 (or tocopherol E3). It is recommended that α-tocotrienol or 5,7,8-trimethyltocotrienol be used when the relationship with tocols and toceneols (with vitamin E activity) is relevant, and tocopherol-3 (or tocochromanol E3) when the relationship with the quinones with isoprenoid side chains (K and Q series) is more important. Similarly, γ-tocotrienol (7,8-trimethyltocotrienol), also known as β-tocopherol, may be designated plastochromanol-3.

3.3.3 Saturation of one or more (but not all) of the double bonds in a multiprenyl side chain should be indicated in the following way:

a. The isoprene units are designated by Roman numerals (I, II, III, etc.) starting from the quinone or chroman nucleus.

b. Additional hydrogen atoms are indicated by the prefixes dihydro, tetrahydro, hexahydro, etc., with the Roman numerals of the units which are reduced, e.g. II-dihydro . . . I, II, III-hexahydro . . .

c. These abbreviations may be abbreviated if necessary (e.g. in tables) to II-H2; I, II, III-H6, etc.

Note: Arabic numerals should not be employed for the units, because such numerals are generally employed for individual atoms.

4. EXAMPLES

The recommended trivial names and abbreviations for some naturally occurring quinones and related compounds are listed in Table III.

Nomenclature and Symbols for Folic Acid and Related Compounds

INTRODUCTION

The folic acids are a group of heterocyclic compounds based on the N-pteridin-6-ylmethyl-pteroyl acid skeleton (see Formula I), often conjugated with one or more L-glutamic acid units.

The semitrivial nomenclature of these compounds and the symbols that are convenient in biochemical studies have been the subject of many proposals during the last few years. In 1962 the IUPAC Commission for the Nomenclature of Biological Chemistry appointed a Subcommission to consider these problems. The Subcommission consisted of L. Jaenicke, Chairman, J. P. English, J. Guest, and F. M. Huennekens. This Subcommission reported in July 1964, and its proposals were considered at the first meeting of the IUPAC-IUB Commission on Biochemical Nomenclature in Salzburg in September 1964. The proposals were adopted in principle, and the resulting Tentative Rules, after slight formal amendments, are presented below.

TENTATIVE RULES

1. Folic acid and folate are to be used only as general terms for any member of the family or a mixture of them.

2. The compounds of this series are based on pteroic acid (Formula I), the systematic name of which is N-(2-amino-4-hydroxypteridin-6-ylmethyl)-pteroyl acid. The salts and the radical derived from the acid are named pteroates and pteroyl, respectively.

3. Numeration—The atoms are numbered as indicated in Formula I.

4 These Tentative Rules replace Rule V-13 of the Rules for the Nomenclature of Vitamins (see Introduction, page 2987) and have been published in IUPAC Information Bulletin No. 23, June 1965, page 52, and in Biochimica et Biophysica Acta, 107, 11 (1965).
Comment—It should be noted that the nitrogen atoms numbered 5, 8, and 10 are unambiguously defined. It is therefore unnecessary to introduce the letter N into names when indicating substitution of these atoms. The bridge carbons are numbered 4a, 8a, so as to permit description of compounds reduced at these positions.

4 Glutamic Acid Conjugates—The compounds in which pteroic acid is conjugated with one or more molecules of glutamic acid are named pteroylglutamic acid, pteroyldiglutamic acid, etc. (The name pteroylmonoglutamic acid is not used.) It is assumed that the second and subsequent molecules of glutamic acid are each linked to the preceding molecule of glutamic acid through the γ-carboxyl group of the latter, thus:

\[
\begin{align*}
\text{COOH} & & \text{COOH} \\
\text{Pteridine} - \text{CO} - \text{NH} - \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{CO} - \text{NH} - \text{CH}_2 - & & \text{CO} - \text{NH} \ldots \text{etc.}
\end{align*}
\]

5 Reduced Compounds—Reduced compounds are indicated by the prefixes “dihydro-,” “tetrahydro-,” etc., with numerals indicating the positions of the additional hydrogen atoms, if known. A tetrahydro- compound is assumed to be 5, 6, 7, 8-tetrahydro- unless indicated otherwise.

The configuration at C-6 of compounds carrying a hydrogen atom at this point is designated present by the symbols (+), (−), or (±), indicating optical activity. When the absolute configuration is known, these symbols may be replaced by R and S.

6 Substituents—The common substituents are indicated by prefixes taken from the general Organic Nomenclature Rules together with the numbers of the positions substituted. These prefixes are listed, together with their symbols, in paragraph 7e below.

For convenience, the prefix indicating reduction (dihydro or tetrahydro) is always placed immediately before the stem name (pteric acid, ptero glutamic acid), even though this conflicts with the general rule that prefixes should be in alphabetical order.

7 Symbols and Abbreviations—It is often convenient to designate compounds of this series by symbols for the sake of brevity, particularly in equations, tables, and figures. The following principles are to be applied. In all cases where confusion might arise, symbols are to be defined, or the names of compounds written out in full.

a. The generic terms, folate and foly, are short and should not be abbreviated.

b. Pteroic acid (or pteroate or pteroyl) is indicated by the three-letter symbol, Pte.

c. The ptero glutamic acids and their salts are indicated by the symbols PteGlu, PteGlu₂, PteGlu₃, etc., the subscript numerals indicating the number of glutamic acid units. (The symbol Glu is taken from the standard amino acid symbols. In the folic acid series, Glu implies γ-glutamic acid linked as indicated in paragraph 4 above, unless stated to the contrary.)

d. Reduced derivatives are indicated by H₂ or H₄ in front of the main symbol with an indication of the position if necessary, thus, e.g. 7, 8-H₂PteGlu, H₄PteGlu₂.

e. Substituents are indicated by their abbreviated formulas as shown in Table IV, prefixed by the position of substitution.

f. H₂, H₄, and other prefixes may be used with “folate” when reduced or other modified material is meant (without specifying the number of glutamic acid units per molecule).

Examples:

<table>
<thead>
<tr>
<th>Formula</th>
<th>Substituent</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-HCO-7,8-H₂PteGlu₂</td>
<td>10-Formyl-7,8-dihydropteroyl-triglutamic acid</td>
</tr>
<tr>
<td>5,10-CH₂-H₂PteGlu</td>
<td>5,10-Methylene tetrahydropteroylglutamic acid</td>
</tr>
<tr>
<td>(±)-5,6-H₄PteGlu</td>
<td>Racemic 5,6-Dihydropteroylglutamic acid</td>
</tr>
<tr>
<td>5,10-CH₂-H₂folate</td>
<td>5,10-Methylene tetrahydrofolic acid (general)</td>
</tr>
</tbody>
</table>

Nomenclature of Corrinoids

Rules

1 Compound I should be designated corrin. The number 20 is omitted in the corrin nucleus so that the numbering system will correspond to that for the porphyrin nucleus. The generic name for compounds containing the corrin nucleus is corrinoid. Pentadecahydrocorrin should be designated corrole.

2 Compound II should be designated cobyrinic acid. The terminal carboxyl groups or modified carboxyl groups are designated by letters a to g, as shown in Formula II.

Cobyrinic acid abedg-hexamide, also known as Factor V, should be designated cobyrinic acid.

3 Compound III (R = −OH; R' = −H) should be designated cobamic acid. Compound III (R = −NH₂; R' = −H) should be designated cobaminamide.

4 Compound III (R = −OH; R' = V) should be designated cobamic acid. Compound III (R = −NH₂; R' = V) should be designated cobamidine.

5 For nucleotides of this series the name of the additional heterocyclic radical, ending in -yl, should be added to the name of the appropriate ion designated in Rules 1 through 6.

Examples:

α-(5,6-Dimethylbenzimidazolyl)cobamide cyanide, also known as vitamin B₁₂ (Formula IV)

α-(2-Methyladenyl)cobamide cyanide, also known as Factor A

α-(5-Hydroxybenzimidazolyl)cobamide cyanide, also known as vitamin B₁₂III

1 These Tentative Rules replace Rule V-15 of the Rules for the Nomenclature of Vitamins (see Introduction, page 2987) and are in press in the IUPAC Information Bulletin.
6 For molecules formed from the ions designated in Rules 1 through 4, the ligand attached to the metal should be designated by the methods used in inorganic chemistry and not by a prefix that would denote substitution in the organic part of the molecule.

   Examples:
   Cobamic acid dichloride
   Dinitrocoobamic acid
   \(\alpha-(5,6\text{-dimethylbenzimidazolyl})\)aquocobamide, also known as vitamin \(\text{B}_{12b}\)

7 When the cobalt atom in Compounds I, II, or III is replaced by that of another metal, the symbol "co-" should be replaced by the name of the other metal followed by "o" or "i" according to the valence. When the cobalt is replaced by hydrogen, the prefix "hydrogeno-" should replace "co-".

   Examples:
   Ferrobamic acid
   Nickelibamic acid
   Hydrogenobamic acid

8 Other compounds should be designated systematically from the largest of the compounds, I through III, that is contained in that derivative.

   Examples:
   Cobyricic acid: \(\text{abcdeg-} \text{hexamamide}\)
   3,8,13,17-Tetraethyl-1,2,5,7,12,15,17,18-undecachlorocobyrinic acid (for the dichloride of fully decarboxylated cobyricic acid)
   12,1'-Carboxycobyric acid (for cobyricic acid in which one of the 12-methyl groups has been replaced by \(-\text{CH}2\text{COOH}\)

9 The compound \(\alpha-(5,6\text{-dimethylbenzimidazolyl})\)cobamide cyanide, also known as vitamin \(\text{B}_{12a}\), may be designated cyanocob(III)alamin.

   The tautomeric compounds \(\alpha-(5,6\text{-dimethylbenzimidazolyl})\)aquocobamide and \(\alpha-(5,6\text{-dimethylbenzimidazolyl})\)hydroxocobamide, also known as vitamin \(\text{B}_{12a}\) or vitamin \(\text{B}_{12b}\), may be designated aquocobalamin or hydroxocobalamin.

   The compound \(\alpha-(5,6\text{-dimethylbenzimidazolyl})\)cobamide nitrite, also known as vitamin \(\text{B}_{12c}\), may be designated nitrito-cobalamin.

   Where it is necessary to specify the state of oxidation of the cobalt atom, the oxidation number may be inserted after "cob-", e.g.

   Vitamin \(\text{B}_{12}\)  Cyaocob(III)alamin
   Vitamin \(\text{B}_{12a}\)  Cyaocob(II)alamin
   Vitamin \(\text{B}_{12c}\)  Cyaocob(I)alamin

10 The coenzyme forms of the \(\text{B}_{12}\) vitamins and their analogues, in all of which an organic ligand is attached to the cobalt atom, may also be named according to these rules. For example the compound known to be concerned in methionine biosynthesis in some systems, in which a methyl group is attached to cobalt, may be designated methylcobalamin or \(\alpha-(5,6\text{-dimethylbenzimidazolyl})\)-Co-methylcobamide.

   Coenzyme \(\text{B}_{12}\) may be designated 5'-deoxyadenosylocobalamin or \(\alpha-(5,6\text{-dimethylbenzimidazolyl})\)-Co-5'-deoxyadenosylocobamide.

   The coenzyme form of pseudovitamin \(\text{B}_{12}\), active in glutamate metabolism in some systems, may be designated \(\alpha-(\text{adenyl})\)-Co-5'-deoxyadenosylocobamide.
Corrinoids

Sketch based on Hodgkin et al. (1957). Detail of substituents on corrin nucleus (except side chain at C-17) is omitted for the sake of clarity.

EXPLANATORY NOTE

The trivial names applied to corrinoids of varying complexity are perhaps confusing to the nonspecialist and it seems desirable to tabulate (in outline) how they are interrelated (Table V).

<table>
<thead>
<tr>
<th>Rule</th>
<th>Specific names, in increasing order of complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Skeleton (porphyrin nucleus minus C-20)</td>
</tr>
<tr>
<td>2</td>
<td>1, with standard side chains and with cobalt</td>
</tr>
<tr>
<td>3</td>
<td>2, with 1-aminopropan-2-ol at position f</td>
</tr>
<tr>
<td>4</td>
<td>3, with α-ribofuranose 3-phosphate at position 2 of aminopropanol</td>
</tr>
<tr>
<td>5</td>
<td>4, with heterocyclic base attached by N-glycosyl link at position 1' of ribose, and attached as ligand to Co; also with (anion)</td>
</tr>
<tr>
<td>9</td>
<td>Many &quot;B12&quot; vitamins and derivatives, in which &quot;heterocyclyl&quot; is 5,6-dimethylbenzimidazolyl, are given the trivial name &quot;cobalamin&quot; prefixed by the name of the appropriate anion</td>
</tr>
<tr>
<td>10</td>
<td>&quot;B12 coenzymes,&quot; compounds in which a further organic group (X-y1) is covalently linked to cobalt, are named X-y1cobalamin or, more generally, heterocyclyl-Co-X-y1cobamide (etc.)</td>
</tr>
</tbody>
</table>

Corrin (I)

Heptacids

Cobyrinic acid (II)

Cobinamide (III-V)

α- or β-Heterocyclylcobamide (anion) (IV)