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VIROLOGY: TERMS AND ETYMOLOGY

Abstract - The present virological terms have been analyzed from the historical and the linguistic points of view as follows: A. Virion: a preliminary comment. B. The virological terms and their Latin background. The declension of virus (poison), vir (man) and vis (force). C. Vir, virus, vires: their compound terms and the choice of the connecting vowel. D. The questions *virorum* (gen. pl. of *vir*, of men), *vīrorum* (gen. pl. of *vīrus*, of viruses), *vīra* (feminine form of *vir*) and *vīra* (nom. pl. of *vīrus*). E. The diminutive forms of *vir*. F. The diminutive forms of *vīrus*. G. *Virellus*. H. *Virino*. I. *Viricule* and the neoterm *virocule* (*virocle*). J. *Virion* and the neoterm *virion(e)*. K. *Provirion*. L. *Virocide*, *viricide*, *virucide* and *viruscide*. M. *Virulicidal* & *virulenticidal*, *viruliferus* & *virulentiferous*. N. *Virusoid*, *viroid*, *subvirus* and *semivirus*. O. *Viromicrosome*, *virosome* and *viroliposome*. P. *Provirus* and *integravirus*. Q. *Capsid*, *procapsid* and *nucleocapsid*. R. *Enveloped* and *naked* viruses. S. The present virological taxonomy: a few linguistic considerations. T. The present viroterminological system.

Key words - *Virino*, *virion-virion*, *provirion-provirion*, *viricule-virocule-virocle*, *virogenoma*, *viromere*, *virosome*, *viromicrosome*, *viroliposome*, *virosa*, *virosales*, *virosidae*, *virosinae*, *virulentiferous*, *virulenticidal*, *capsid*, *nucleocapsid*, *procapsid*, *capsoid*, *nucleocapsoid*, *procapsoid*, *capsomere*, *peplos*, *peplomere*, *peplovirus-apeplovirus*, *cutivirus-acutivirus*, *tunicavirus-atunicavirus*, *dermatovirus*, *integravirus*, *provirus*, *retrovirus*.

Riassunto - *Virologia: termini ed etimologia*. L'autore, premessi alcuni dati storici assai notevoli (opere di Thierry de Héry: 1552 e di Ambroise Paré: 1568, 1575), analizza linguisticamente l'attuale terminologia virologica. Evidenzia i dettagli della base linguistica latina di tale terminologia e corregge i più noti termini correnti quali, ad esempio, *virione* (da modificare in *virone*) ecc. Inoltre enfatizza la necessità di realizzare un'auspicabile uniformità all'interno del presente sistema terminologico. A tale scopo propone l'adozione regolare del prefisso *vir* eventualmente seguito dalla lettera o quale vocale di connessione cioè la «comb. Form» *viro-* della presente letteratura di lingua inglese. Sono, infine, proposti nuovi termini quali ad esempio *integravirus*, *viroliposome*, la coppia *tunica virus-atunica virus* per qualificare l'attuale coppia «enveloped virus»-«naked virus».

Parole chiave - *Virino*, *virion-virion*, *provirion-provirion*, *viricule-virocule-virocle*, *virogenoma*, *viromera*, *virosoma*, *viromicrosoma*, *viroliposoma*, *virosa*, *virosales*, *virosidae*, *virosinae*, *virulentifero*, *virulenticida*, *capside*, *nucleocapside*, *procapside*, *capsoido*, *nucleocapsoido*, *procapsoido*, *capsomero*, *peplos*, *peplomero*, *peplovirus-apeplovirus*, *cutivirus-acutivirus*, *tunicavirus-atunicavirus*, *dermatovirus*, *integravirus*, *provirus*, *retrovirus*.

INTRODUCTION

Looking for relevant data to become a matter for discussion in terminological panels of future biomedical congresses, I wish, with the present paper, to point out the linguistic weakness and disharmony of the present virological terms. However, a few preliminary considerations should be advanced.

First, I realize that scientists, fully engaged in the experimental research, do not have time for terminological questions nor can they be enthusiastic for a criticism which can be, at a first glance, defined only as a linguistic exercise. Moreover, if they do not have a wide humanistic background, they may disregard any terminological problem.

Second, since often the scientific excellence of the authors covers instances of linguistic weakness, in such cases the criticism might also be misinterpreted or, at least, discouraged.

Third, since the modern scientific dictionaries usually do not quote obsolete or old terms, such a simplification, together with the lack of detailed and comprehensive terminological accounts in the current literature, may result in a bona fide reinvention of terms already proposed in the past. This is, for instance, the case with the terms *centromere*, *chromosome*, *dictyosome*, *karyosome*, *nucleosome*, *cryptopolyploidy*, etc. (cf. Battaglia, 1993-2003).

Fourth, it should be firmly established that a simple variation of the spelling of a term does not justify any change of its definition or a reinterpretation. This is, for instance, the case of the couplet *chromonema* (Vejdovsky, 1912) and *chromoneme* (Whitehouse, 1969) quoted by the McGraw-Hill Dictionary of Scientific and Technical Terms (1994, p. 370) as follows: «*chromonema* (CYTOL). The coiled core of a chromatid, it is thought to contain the genes. *chromoneme* (GEN). The genetic material of a bacterium or virus, as distinguished from true chromosomes in plant or animal cells».

Similarly, the dictionary of Genetics by King & Stansfield (1990, p. 60) records: «*chromonema* (plural *chromonemata*) the chromosome thread. *chromoneme* the DNA thread of bacteria and their viruses».

Fifth, to the terms should be given a definition in agreement with their literal meaning and etymology. For instance, *nucleofilament* is nothing else than the English translation of the German word *Kernfaden*, a classic cytological term used by authors of the last

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century and conveys the meaning of nuclear thread. By contrast, in relation to the structure of chromatin, Finch & Klug (1976, p. 1897) write: «a flexible chain of repeating structural units of about 100 Å diameter... We call this close-packed chain a nucleofilament». Consequently, and given that the above problems or questions cannot be solved by ignoring their existence, the author presents this account, which is, at the same time, complementary to other related papers already published (cf. Battaglia, 1993-2003).

HISTORICAL BACKGROUND

As used by the classical authors, the Latin term *virus* covers different meanings, namely poison (Vergil, *Celsus*, Cicero), offensive odor (cf. «*virus alarum sudorisque*» of Pliny) *etc.* In the Middle Ages and in the Renaissance, the Medieval scholars adopted the term *virus* as a synonym of poison, cf. Saliceto (Guglielmo da Saliceto or Gulielmus de Saliceto, 1210-1276, *Chirurgia*: 1275, printed in Italian: Venice 1474, printed in French: Lyon 1492), an Italian surgeon who taught at Bologna (1269), his pupil Lanfranc (Lanfranco da Milano or Lanfrancus Mediolanensis, d. 1315, *Chirurgia magna*: Lyon 1270, «*Chirurgia parva*»: Paris 1296), Guy de Chauliac (1300-1368), *La grande chirurgie ... composée l'an de grace 1363*: Tournon) *etc.* (Poynter, 1996).

The use of this term, by French authors, is also interesting: Thierry de Héry (1552) mentioned «*virus*» in his *La methode curatoire de la maladie venerienne* (by courtesy of H.J.M. Symons, Curator Early Printed Books, Wellcome Institute for the History of Medicine, London, U.K.) and the term was shortly afterwards adopted by Ambroise Paré (1575: *Les Oeuvres*). These extensive volumes, *Les Oeuvres d'Ambroise Paré, conseiller et premier chirurgien du Roi...*, en vingt six livres... 1575, first edition, constitutes the main work of this famous French surgeon and has been repeatedly enlarged and reprinted (1579: «*la seconde édition ... en vingt sept livres*»; 1582: Latin edition; 1585: «*quatriesme édition en vingt huit livres*»; 1634: first English translation; 1664: «*douzieme édition, revevè et corrigée*» *etc.*). The choice of the term *virus* by Paré became widely known by medical scientists only in the first half of the nineteenth century by merit of J.F. Malgaigne who reprinted (1840-41) and edited Paré's scientific work.

I wish to emphasize the following expressions which can be found in Malgaigne's edition, namely: cf. vol. II, p. 528: «*virus vérolique ... Puis le virus pullulera et cheminera par les veines, arteres et nerfs aux parties nobles*»; cf. vol. III, p. 878, Table analytique. «*VIRUS. En quelle humeur est enraciné les virus vérolique; II, 230. - Transmission de ce virus de la nourrice à l'enfant et réciproquement; II, 529. - Traitement des nodus venant de ce virus; II, 579. - Sur le virus arthritique; III, 209 et suiv. - Qualités du virus rabique; III. 308...*».

The sentences quoted above are of great interest since they testify to the causative meaning ascribed by Paré to the classic Latin noun *virus*. Today, it is surprising to see how much this interpretation of the term *virus* has been overlooked.

For instance, as regards the eighteenth century, the term *virus* has not been quoted by the notable «*medicinal dictionary*» of Robert James (English edition: 1743-45; French edition: 1746-48, Italian edition: 1753, *etc.*).

Further, as regards modern medical literature, the works of Thierry de Héry (1552) as well as those of Ambroise Paré (1568, 1575 *etc.*) have been overlooked, see for instance, Skinner (1970), Hughes (1977) *etc.* In any case, it is beyond the purpose of the present account to quote or discuss additional and better known historical data of virological interest, cf. the recent text-books by Waterson & Wilkinson (1978), Oldstone (1998), Domínguez *et al.* (1999) *etc.*

A. VIRION: A PRELIMINARY COMMENT

Following an earlier proposal of the term *viricule*, Lwoff *et al.* (1959), coined the term *virion*. Their proposal deserves a full quotation, namely: «*Beard [17] a proposé d'attribuer un nom distinctif à la particule infectieuse virale et a proposé 'viricule' qui veut dire petit virus et n'est, par conséquent, pas satisfaisant. Nous proposons 'virion', unité de virus, qui peut être utilisé aussi bien dans les langues latines qu'anglo-saxonnes (prononciation anglaise vir'i-on). [17] Beard (J.W.). In Symposium on Latency and masking in viral and rickettsial Infections. Burgess, Minneapolis, 1957, 201.*

Differently from *virion* and differently from what we expected, *viricule* has not been recorded by any scientific dictionary. However, such a term cannot be ignored when performing a linguistic discussion of the term *virion*. Further, in the course of the present analysis, which automatically involved a joint consideration of common and related words such as, *e.g.*, *virosome*, it was evident that experienced scientists frequently proposed terms disregarding, or *bona fide* ignoring, the related etymological meanings.

Since the present virological terms have been coined by individual preferences often without, or not supported by, a sound linguistic discussion, the author believes that there has to be a strong commitment to accomplish a preliminary discussion of the etymological backgrounds of the current virological terms. To be adequate, such an analysis needs a wide linguistic examination of Latin nouns such as *virus*, *vir* (man), *vires* (plural of *vis*, force) and of their declensions, their derivatives and compound terms.

The almost complete lack of linguistic accounts in the current scientific literature has greatly encouraged the author in the present linguistic task.

B. THE VIROLOGICAL TERMS AND THEIR LATIN BACKGROUND. THE DECLENSION OF VIRUS (POISON), VIR (MAN) AND VIS (FORCE)

As regards the present virological terms, it is necessary to point out that they are derivatives, or compound terms, of the Latin noun *vīrus* (poison, Second declension, neuter gen. *vīri*, stem *vīr-*).

All of the ancient grammarians are in agreement that the word *virus* is used in the singular only and according to

the second declension neuter. As a matter of fact, no plural forms of *virus* are attested in the extant Latin works. However, the modern languages which have adopted *virus*, pluralize this word in their own fashion, e.g. English *viruses*, German *Viren* whilst French and Italian still retain *virus* for both singular and plural forms.

In modern times, and mainly for taxonomic purposes, this matter, together with the plural forms of *virus* (*vira* and *virorum*) have been analyzed and discussed by Brown (1927, 1956) and by Stearn (1966 and later editions). Further, the Latin declension of *virus* has also been recently commented on by Smutny (1999 and 2000) in disagreement with van den Bogaard (1999). Since widely ignored by the biological literature, the details of the declension of *virus* deserve mention and have here been assembled in Table 1.

It is also necessary to quote the occurrence, in classic Latin, of two terms (together with their declension) linguistically very similar to *virus*, namely:

- *vīr* (man, Second declension, gen. sg. *vīri*, stem *vīr-*, see Tab. 1);
- *vīs* (force, Third declension, acc. sg. *vīm*, abl. sg. *vī*, pl. cases: *vīres*, *vīrium*, *vīribus*, stem *vīri-*, see Tab. 1). The stem or operating base of a noun can be determined by removing the case-ending of the genitive singular, that is *-i* for both *vīr* (gen. sg. *vīri*, stem *vīr-*) and *vīrus* (gen. sg. *vīri*, stem *vīr-*). Analogously, as regards *vīres* (gen. *vīrium*), *-um* is the case-ending to be removed and *vīri-* the stem.

The vowels are described as «long» and marked with a ¯, or «short» and marked with a ˇ.

Yet in the classic Latin, the occurrence of these very similar stems (*vīr-*, *vīr-* and *vīri-*) gave rise to linguistic ambiguity, that is the formation of almost identical derivatives and compound terms. Naturally the Latin authors made distinction between *vīrosus* (*vīr-* + *osus*) and *vīrosus* (*vīr-* + *osus*), between *vīripotens* (*vīr-* + *i* + *potens*) and *vīripotens* (*vīri-* + *potens*, see later), etc. Equally, the same suffix *-osus*, if referred to *vīres* (*vīrium*) gives rise to the derivative *vīriosus*. Obviously, the nouns *vīrosus*, *vīrosus* and *vīriosus* convey different meanings, namely (cf. the Oxford Latin Dictionary, 1996):

- *vīrosus*: «of women having an excessive craving for men»;
- *vīrosus*: «having an unpleasantly strong taste»;
- *vīriosus*: «powerful in effect».

In this order of considerations it is worth recalling that the modern term *viral* should be recognized as a derivative of *vīrus* (that is *vīr-* + *al*) and not a term referable to the Latin *vīralis* (from *vīr*, cf. *decemvīralis*, *triumvīralis*, etc.). It is also worth adding that the suffix *-al*, when referred, to *vīres* (*vīrium*, stem *vīri-*) gives rise to the derivative *vīrial* (*vīri-* + *al*), which obviously should convey a meaning referable to the concept of force, strength or violence. Indeed, *virial* is a term coined in the modern times (cf. the entries *virial*, *virial coefficients* and *virial theorem*, of the current scientific dictionaries) and shares meanings in full agreement with the etymology of the word (the Webster's Third New Intern. Dictionary [1986] records: «*virial* ... G. fr. L. *vires*, pl. strength ... akin to L. *vis* strength, force...»).

Last but not least, the question of the connecting vowel, or the so-called combining form, should not be overlooked in discussing the terminology referable to *vīr*, *vīrus* and *vīres*. However, this is a question of actual linguistic importance and needs a separate discussion (cf. next Chapter).

C. VIR, VIRUS, VIRES: THEIR COMPOUND TERMS AND THE CHOICE OF THE CONNECTING VOWEL

Let us first consider the question of the derivatives and compound terms referable to *vīr*, stem *vīr-*.

In this instance, the letter *i* is the classic connecting vowel and the combining form *vir-i* has, regularly, been employed in all cases where the second part of the term begins with a consonant. Therefore, the Latin noun *vīripotens*, already quoted, should be, analytically, interpreted as *vīr* + *i* + *potens* (the Oxford Latin Dictionary [1996] quotes: «*vīripotens*, also *virī potens* (*vir* + *potens*), of a girl capable of having sexual relation with a man»).

On the contrary, no connecting vowel is needed in the formation of the almost identical Latin noun *vīripotens* (the Oxford Latin Dictionary [1996] records: «*vīripotens* [*vires* (*vis*) + *potens*], outstanding in power»). Here, the compound originates from the prefix *vīri-*, that is the stem referable to *vīres* (*vīrium*), and the suffix *-potens* (the stem *vīri-*, since it ends in the vowel *i*, does not require any additional connecting vowel).

Tab. 1

	Second declension		Second declension		Third declension	
	Vīr man, stem vīr-		Vīrus poison, stem vīr-		Vīs force, stem vīri-	
	Sing.	Pl.	Sing.	Pl.	Sing.	Pl.
Nom.	vīr	vīrī	vīrūs	---	vīs	vīrēs
Gen.	vīrī	vīrōrum & vīrūm	vīrī	---	vīs	vīrīum
Dat.	vīrō	vīrīs	---	---	vī	vīrībūs
Acc.	vīrūm	vīrōs	vīrūs	---	vīm	vīrēs
Voc.	vīr	vīrī	---	---	vīs	vīrēs
Abl.	vīrō	vīrīs	vīrō	---	vī	vīrībūs

As regards the derivatives of the noun *virus*, the Latin language records only *virulentiam* and *virulentus*.

Moreover, the Latin authors confined the employment of *virus* usually to the nominative and accusative cases (*vīrus*) and, exceptionally, to the genitive (*vīri*) and the ablative (*vīro*), see Table 1.

As regards the modern scientific terminology, beside viral (*vīr* + *al*), the compound *virology* has, unanimously, been accepted and interpreted as *vir(us)* + *o* + *logy*, that is the stem *vīr-* followed by the connecting vowel *o*. Consequently, for the sake of linguistic uniformity, the prefix *viro*, *i.e.* the comb. form *vir-o-*, should be recognized as the basis of the present viroterminological system, see further Chapter T.

D. THE QUESTIONS *VĪRORUM* (GEN. PL. OF *VĪR*, OF MEN), *VĪRORUM* (GEN. PL. OF *VĪRUS*, OF VIRUSES), *VĪRA* (FEMININE FORM OF *VĪR*) AND *VĪRA* (NOM. PL. OF *VĪRUS*)

Vir belongs to the Second declension and is the only noun ending in *-ir*, cf. Table 1. It is declined as *puer* (gen. *puer-i*), thus, by analogy with the regular feminine *puer-a*, the case *vir-a*, should be recognized as the feminine form of *vīr* and not the nominative plural of *vīrus* (see below).

The interpretations of *vīra* and *vīrorum* as plural forms of *vīrus* are mainly supported by W.T. Stearn (1992, p. 528). This author, quoting the entry *virus* writes «*virus, gen. sing. viri, nom. pl. vira, gen. pl. vīrorum* (to be distinguished from *vīrorum*, of man)».

Stearn (1992, p. 70) also writes that nouns ending in *-er* (Second declension) are declined as *ager* (gen. *agri*) and quotes *diameter*, *liber*, *meter*, *vesper* and *vir*. Apart from the minor consideration that *vir* (gen. *viri*), is declined as *puer* (gen. *puer-i*), we must recall that the declension of *vir* is atypical because its usual genitive plural is *virūm* (Verg., Prop. «*venies in ora virūm*»). *Virūm* is the syncopated form of the gen. plur. *vīrorum* which is usually recorded, although unfrequently, for *septemvir*, *decemvir* (gen. pl. *decemvirum* and *decemvirorum*), *quinquedecemviri* (gen. pl. *quinquedecemvirum* and

quinquedecemvirorum) *etc.* The gen. pl. *vīrorum* is mostly used with reference to the masculinity, thus, for instance, in the Latin literature, the male sex is recorded as «genus *vīrorum*» (Liv., Ov.), in place of «genus *virile*», while «genus *humanum*» (Cic.) is preferred to «*hominum genus*» (Sall.) to indicate the human race. Further, as regards the quotation of *vīrorum* as gen. pl. of *vīrus*, we recall that all the plural cases of *vīrus* are not found in the Latin literature (see Tab. 2).

The term *vira*, indeed, deserves an additional comment.

Vira is known only as the feminine form of *vīr* (*vīra*, -ae, woman, cf. Sextus Pompeius Festus, *De significatione verborum* «*feminas antiqui, quas nunc dicimus, vira appellabant...*») and it has never been quoted, by Latin authors, as the nom. pl. of *virus*.

Incidentally, Brown (1956, p. 52) records *vira* as the feminine form of *vir*, while Stearn (1992, p. 528), as already cited, accepts *vira* as the nom. pl. of *virus* and distinguishes between *vīrorum* (gen. pl. of *vīr*) and *vīrorum* (gen. pl. of *vīrus*).

I have been compelled to point out the right linguistic meaning of *vira*, because in the taxonomic system of viruses have been introduced the expressions «*Phylum vira*», «*Subphyla: DNA Deoxyvira & RNA Ribovira*», cf. Lwoff & Tournier 1966, p. 52: *The classification of viruses*.

Since this question of nomenclature requires particular attention and given that *vīra* is a questionable term, the author would like to propose «*virosa*», from the Latin «*virosum*», as a linguistically appropriate alternative to the term *vīra*, as quoted above.

E. THE DIMINUTIVE FORMS OF *VĪR*

For the sake of linguistic clarity, it is very useful to make a preliminary analysis of the diminutive forms of the Latin noun *vīr*.

First, since the noun *vir* conveys the meaning of superlativeness and particularly in relation to *homo*, no diminutive forms of *vir* do exist in the Latin language.

Tab. 2 - *Virus*: Latin quotations.

Nom. & acc. sing.: virus.
Semen: <i>lentum destillat ab inguine virus</i> Verg.G. 3.281.
Poison: <i>malum virus serpentibus</i> Verg.G. 1.129.
Smell: <i>virus alarum sudorisque sedat</i> Plin. Nat. 35.185.
Salt: <i>aequor Ionium glaucis aspergit virus ab undis</i> Lucr. 1.719.
Rhetoric: <i>ubi illud malum virus latitat</i> Sen. Nat. 5.15.4.
Rhetoric: <i>ut non anquirat aliquem, apud quem evomat virus acerbitalis suae</i> Cic. Amic. 87.
Gen. sing.: viri.
Salt element: <i>est ratio discernendi...umor dulcis..., linquit enim supera taetri primordia viri</i> Lucr.2.476.
Abl. sing.: viro.
Smell: <i>quam minime ut possit mixtos in corpore concoctosque suo contractans perdere viro</i> Lucr.2.853.

On the contrary, there are at least two well-known diminutive forms referable to homo (gen. sg. hominis, Third declension), that is homullus and homunculus.

Secondly, it is worth recalling that the most commonly used diminutive suffix for compound words belonging to the Second declension is -ulus (a, um). Therefore, the diminutive *vīr-ulus* is the logical consequence. Indeed, there are also a few other diminutive suffixes to be taken into consideration, namely -inus (a, um), -ellus (a, um) and -culus (a, um). However, these suffixes are infrequently used with nouns belonging to the Second declension, so that the following examples are worth quoting:

- equus, gen. equi: equinus (beside equulus);
- taurus, gen. tauri: taurinus (beside taurulus);
- locus, gen. loci: locellus (beside loculus);
- porcus, gen. porci: porcellus (beside porculus and porcinus);
- pannus, gen. panni: panniculus (beside pannulus);
- servus, gen. servi: serviculus (beside servulus).

The above considerations support the following conclusive statement: beside *vīrulus*, the possible Latin terms *vīrinus* (cf. Chapter H), *vīrellus* (cf. Chapter G) and *vīriculus* (cf. Chapter I) should linguistically be recognized as possible diminutive forms of *vīr*.

As regards the corresponding diminutives referable to the Latin *vīrus*, cf. Chapter F.

F. THE DIMINUTIVE FORMS OF VIRUS

It is well worth recalling that the Latin noun *virus* belongs to the neuter gender and that the Latin diminutives have the same gender as the parent noun. Therefore, the adjectival diminutives of *virus* would take the regular -um as gender ending.

The search for a diminutive form of *virus* should be easily accomplished by assuming that *virus* is a noun belonging to the Third declension. Indeed, there is a considerable linguistic coincidence between *virus* (Second declension) and some nouns belonging to the Third declension, as for instance *corp-us* (-ulentia, -ulentus) and *op-us* (-ulentia, -ulentus) in comparison with *vīrus* (-ulentia, -ulentus). Therefore, the diminutive forms ascribed (cf. the English dictionaries) to *corpus* and *opus*, e.g. *corpusculum* & *corpuscule* (also *corpuscle*) and *opusculum* & *opuscule* (also *opuscle*) respectively, would suggest the corresponding forms *virusculum* & *viruscule* (also *viruscle*).

However, the noun *vīrus* belongs to the Second declension, so that the stem *vīr* should be linked to the suffix -ulum (or -inum, -ellum, -culum). It follows that the possible Latin terms *vīrulus*, *vīrinum*, *vīrellum* and *vīr-oculum* should be recognized as regular diminutive forms of *vīrus*.

G. VIRELLUS

Linguistically the possible Latin term *virellus* should be interpreted as a diminutive form of *vīr* (*vīri*), that is *vīr-ellus* (cf. *vīrellum*, the corresponding diminutive form of *vīrus*).

Virellus does not occur in the Latin language and is a relatively modern invention. By the end of last century it has been recorded by the botanists as a diminutive form of the Latin *vīrens* (*vīrentis*), cf. the Glossary of Botanical Terms of Jackson (1910, 1928), namely: «*virellus* (dim. of *virens*), somewhat green or greenish».

It is also quoted, with the same meaning, by Stearn (1992, p. 528). However, on purely linguistic ground this botanical interpretation of *virellus* should be refuted because any diminutive form of *virens* (gen. *virentis*, from the verb *vireo*, see also the English *virent*) requires the stem *virent-*. Consequently, *virent-ellus* or *virent-ulus*, should be the linguistically correct diminutive forms of the Latin adjective *virescens*.

Moreover, the concept of greenish (cf. the Latin *subviridis*), should be ascribed, on correct etymological basis, to other diminutive forms of the Latin *viridis* such as *virid-ulus* and *virid-ellus*.

In this context and as regards plant taxonomy, we cannot overlook that «the epithet *virellus*, -a, -um, has an infrequent but regular use in eight different names belonging to as many plant families); *virentellus* is never used, *viridellus* only exceptionally (3 times for 2 taxa, one species and one hybrid)» (by courtesy of Prof. Werner Greuter, Botanic Garden and Museum, Berlin-Dahlem Free University, Germany).

H. VIRINO

Linguistic considerations allow the following comment of the modern term *virino*. The term *virino* is recorded by all recent scientific dictionaries, cf. Singleton & Sainsbury (1996), Henderson's Dictionary of Biological Terms, eleventh ed. by E. Lawrence (1995), Oxford Dictionary of Biochemistry and Molecular Biology (1997) *etc.*, always without mention of the terminological paternity. This term, indeed, has been coined by A.G. Dickinson & W. Outram, in an interpretatively relevant account published in 1979 and quoted as follows: «If the recent experimental results of Marsh and Malone are correct in implicating DNA as a necessary component of the infective unit of scrapie, then an appropriate name for this class of agent would be «*virinos*», which (by analogy with *neutrinos*) are small, immunologically neutral particles with high penetration properties but needing special criteria to detect their presence».

Apart from the consideration that the «infective unit of scrapie», the prion, is a «Peculiar Protein» (cf. Ridley & Baker, 1998, p. 105: the criticism on *virino*; see also Collinge & Palmer, 1997), as regards the virological terms, is evident the relation between the Latin *virinum* and the modern *virino*. Obviously, *virino* should signify little virus. The author, however, does not support the introduction of the term *virino* with such a meaning. Writing of viruses, it is very questionable to introduce a distinction between little and non-little viruses particularly on the absence of quantitative data.

In addition, there are other linguistic grounds for introducing the concept of smallness referred to *virus*, for instance *mini-virus* and *parvi-virus* could be suggested, however in these cases the taxonomic existence of the

minireoviruses and the parvoviruses should be considered (cf. Fields Virology 1996, *etc.*).

All above critical considerations suggest recording the term *virino* in the scientific dictionaries only for historical reasons.

I. VIRICULE AND THE NEOTERM VIROCULE (VIROCLE)

The question of the term *viricule* may be summarized as follows.

This term can be referred to the Latin possible noun *vīriculus*, from *vīr*. Since Beard (1957 [Lwoff *et al.*, 1959], cf. Chapter A), assigned to his *viricule* a meaning referable to *vīrus*, and given that the present viral terminology is based on the combining form *vīro-*, the neoterm *virocul* (or *virocle*) is the linguistically correct alternative to Beard's *viricule*.

J. VIRION(E) AND THE NEOTERM VIRON(E)

Linguistically the term *virion(e)*, that is the *virion* of Lwoff *et al.* (1959), consists of the prefix *vīri-*, followed by the suffix *-one*. The suffix *-one* is a very common suffix in the scientific compound terms, and in the present example conveys the meaning of elementary unit. The prefix *vīri-* is the stem of the Latin noun *vis* (force, pl. *vires*), see also the comparative form *virior*, the adjective *viriosus*, the adverb *viriose* *etc.* cf. Table 3. There is no relation between the prefix *vīri-* and the noun *vīrus*, thus *virion(e)* means «unit of force». Inaccurately, Lwoff *et al.* (1959) ascribed to their *virion* an etymological relation to the Latin *vīrus*.

In this order of considerations, in modern English, it is worth recalling that it has been ascribed a correct meaning in agreement with its etymology, to the scientific term *virial* (already cited, cf. Chapter B: *virial* coefficient, *virial* theme), that is considering the prefix *vīri-* as the stem of the Latin *vīres* (*vīrium*).

Now, the Latin considerations already advanced easily suggest the coining of *viron(e)* (*vir* + *one*), as the only linguistically correct alternative to the *virion(e)* of Lwoff *et al.* (cf. Tab. 3).

K. PROVIRION

Since, for the sake of linguistic accuracy, I have already proposed *viron(e)* in the place of *virion*, almost automatically *provirion* should be modified to *proviron(e)*. The term *provirion* has been coined by Fernandez-Tomas & Baltimore (1973, cf. p. 1122) and namely: «The present investigation is concerned with the isolation of a new poliovirus-specific ribonucleoprotein particle. It consists of the procapsid proteins plus viral RNA and we have provisionally named it the *provirion* to denote its apparent role as the progenitor of the *virion*», see also p. 1125: «This particle, which we call the *provirion*».

Apart from biochemical considerations, the author does not support the introduction of *proviron(e)* because this

term, conceptually, does not differ from *provirus* earlier proposed by Temin (1964). In any case, very similar terms, such as *subvirion* (Gluck, 1997) should be modified to *subviron(e)*.

L. VIROCIDE, VIRICIDE, VIRUCIDE AND VIRUSCIDE

Many terms have been coined to define an agent able of destroying viruses, see for instance, Webster's Third Intern. Dict. (1986): *viricide(al)*, *virucide(al)* and *viruscide(al)*; Singleton & Sainsbury (1996): *viricidal* and *virucidal*; Dorland's Ill. Med. Dict. (2000): *viricide(al)* and *virucide(al)*; *virucidal* in Mahy (1997) and in Acad. Press Dict. Science and Technol. (1992). The term *virocidal* can be found in Kahl's Dict. of Gene Technology (1995) and the couplet *viricide* & *viroicide* is entered by Churchill's Ill. Med. Dict. (1989).

In the current terminology, the suffix *-cide* (from the Latin *-cida*, *-cidium*, cf. *matricida*, *matricidium*) means killer, while the suffix *-cidal* refers to the concept of «having power to kill». Following an easy phonetical concordance with analogous terms such as *bactericide*, *matricide*, *pesticide* *etc.*, it has been coined *viricide*, giving to this term the meaning of «killer of virus». However this statement is questionable because the proper term corresponding to the concept of «virus killer» is *viroicide*, *i.e.* *vīr(us)* + *o* + *-cide*. *Virocide*, together with *virocidal*, agree with the present virological terminology which is characterized by the general adoption of the combining form *viro-*.

Finally, there is an easy critique versus the two terms left over, that is *viruscide* (*-al*) and *virucide* (*-al*). The compound terms, as a general rule and with only a few exceptions, do not retain the nominative form as by contrast, in the term *viruscide* here analysed. As regards *virucide*, the linguistic interpretation *vir(us)* + *u* + *-cide*, should be refuted, because in the present terminology the connecting vowel in the *virus*-compound terms is the letter *o*, as in *virology*, *i.e.* *vir(us)* + *o* + (*-logy*).

M. VIRULICIDAL & VIRULENTICIDAL, VIRULIFERUS & VIRULENTIFEROUS

The English term *virulence* (*-cy*) descends from the late Latin *virulentia* (cf. Tab. 3) and consequently its derivative and compound words would require the stem *virulent-* followed by the connecting vowel *-i*.

This linguistic rule allows to coin some adjectives such as *virulentiferous*, *i.e.* «yielding virulence or virulent agents» and *virulenticial* (*-e*), *i.e.* «capable of destroying virulence and killing virulent agents».

The present virological literature records two similar adjectives, namely *viruliferous* (the Webster's Dictionary [1986] records «*viruliferous*, adj [virulence + *-iferous*]: containing, producing, or conveying an agent of infection [as a bacterium, virus]»), and *virulicidal* (the Dorland's Dictionary [2000] records «*viruliferous*, [virus + *ferous*] conveying or producing a virus or other noxious agent»; «*virulicidal*, destructive of virulence; capable of destroying the deleterious potency of a virus or other

Tab. 3 - Virus, vir and vis (vires): main derivative and compound terms.		
Vīrus, vīri stem: vīr- comb. form: vīr-o-	Vīr, vīri stem: vīr- comb. form: vīr-i-	Vīres, vīrium stem: vīri- comb. form: vīri-
vīrulentia Sid.	vīracius Varr. Men. 300 ^{1 2}	vīriatum, vīriatus Lucil. ³
vīrulentus Gell. 16.11.2.	vīratus Varr.	vīriosus Apul. Met. ⁴
vīrosus Cat. Agr. 157.14.	vīrosus Afran., Apul., Lucil.	vīripotens Plaut. Pers. 252.
Cels. 2.21.	vīripotens Dig. 36.2.30.	vīriculae Apul. Met. 11.28.
Verg.G. 1.56.	vīrilis (-ilitas, -iliter, -ilitim).	vīritior Novatian. trin. 2.11.
	vīriplaca Val. Max. 2.1.6.	vīritim Ven. For. pr. 4.
	vīritim Plaut. Pseud. 411.	
	vīritanus Paul Fest 373.	
	vīrites Gell. 13.23.2.	
	-vīralis ⁵	
	-vīralicius ⁶	
	vīra Paul Fest 261.	
Afran.: Lucius Afranius.	Paul.: Paulus Diaconus.	
Apul.: Apuleius.	Plaut.: Titus Maccius Plautus.	
Cat.: Marcus Porcius Cato.	Sid.: Gaius Sollius Apollinaris Modestus Sidonius.	
Cels.: Aulus Cornelius Celsus.	Ter.: Publius Terentius.	
Dig.: Digesta Justiniani.	Tert.: Quintus Septimius Florens Tertullianus.	
Fest.: Sextus Pompeius Festus.	Val. Max: Valerius Maximus.	
Gell.: Aulus Gellius.	Varr.: Marcus Terentius Varro.	
Lucil.: Gaius Lucilius.	Ven. Fort.: Venatius Fortunatus.	
Lucr.: Titus Lucretius Carus.	Verg.: Publius Vergilius Maro.	
Non.: Nonius Marcellus.		
Novatian.: Novatianus.		
¹ Cf. Varro, Men. 300: «si non malit vir viracius uxorem habere Atalantam». ² also ascribed to vīres-vīrium by Nonius, cf. Lindsay (1903, p. 275): «VIRACIUM, magnarum virium, Varr. Meleagris (300)». For the sake of linguistic accuracy vīracius should be ascribed to vīr. ³ Cf. Lucilius, Lib. 26.55: «viriatum dictum est magnarum virium». However, ascribed to vīria (bracelet), cf. Plin. Nat.33.39, the Latin literature also records vīriatus (a, um) cf. Lucil. in Non. ⁴ Also vīriose and vīriosius Tert. ⁵ Cf. duo...quinquedecemviralis. ⁶ Cf. quinquéviralicius.		

noxious agent»). These two adjectives have been incorrectly qualified as derivatives of virus or of virulence. Therefore the author presents the couplet «virulentiferous & virulentidal» as an orthodox linguistic alternative of the present «viruliferous & virulicidal».

N. VIRUSOID, VIROID, SUBVIRUS AND SEMIVIRUS

Virusoid linguistically means virus-like, *i.e.* virus + oid, from the Greek suffix -oidēs (Latin oīdes: «resembling», «having the appearance of»).

Virusoid is a linguistically incorrect derivative, whilst viroid, *i.e.* vir(us) + oid, is the correct form.

Virusoid or viroid allow only vague definitions so that they should be replaced by more qualifying terms. In any case it is questionable ascribing to them the present meaning of ssRNA or small RNA genomes, cf. the current scientific literature.

As regards the paternity over virusoid, the Glossary of Genetics by Rieger *et al.* (1991) records the entry «virusoid (Randles *et al.*, 1981)». However, this last paper only refers to the discovery of «a representative of a previously unrecognized virus group», char-

acterized by «the presence of an encapsidated circular single-stranded component», and quotes the sentence «viroid-like RNA». Incidentally, the viroid-like adjective is an instance of sheer tautology since viroid, by itself, means virus-like.

As far as I know, the first sentence quoting and defining the term virusoid as «the viroid-like RNAs (virusoid) of velvet tobacco mottle virus (VTMoV)», can be found in a paper by Haseloff *et al.* (1982). Here, a paternity over virusoid is not claimed, while a contemporary paper by the same authors (Haseloff & Symons, 1982) records only the sentence «viroid-like RNAs».

I am now aware, by courtesy of Prof. Robert Symons (Univ. of Adelaide, Australia), that *virusoid* was first suggested, about the years 1981-82, by Dr. Adrian Gibbs of the Research School of Biological Sciences, Australian National University in Canberra, Australia, but he never published nor claimed the paternity over the term. Gibbs first coined virusoid to describe the complex of viral RNA and viroid-like RNA, while, later, Haseloff, Symons and coll.s gave to virusoid a meaning different to that originally conceived (see also «Viroids and Virusoids» in Fields Virology 1996, p. 155).

Now I will pass to discuss the term viroid. As regards the origin of this term, the Glossary of Genetics of Rieger *et al.* (1991) records «viroid (Diener, 1971)», however viroid was coined by Altenburg (1946) to designate hypothetical «ultra-microscopic organisms which are akin to viruses but which are useful symbionts... that... occur *universally* within the cells of larger organisms». Many years later, Diener (1971) redefined the term to include the case of infective nucleic acids, too small to contain the genetic information necessary for self-replication and with no capsid protein such as the potato spindle tuber virus.

Finally, I cannot avoid to take into consideration the rather complex question of finding alternative terms to viroid.

Apart from the obvious consideration that this question should be more adequately discussed if it is included in a future updated revision of the virological terms, some alternatives such as paravirus and subvirus should be considered.

Moreover, since the infective status due to viroids appears to be a virus-like pathology induced by agents *less organized* than the typical viruses, the term subviroid seems to be preferable to the present viroid.

In addition, since the virus, basically, consists of a first genetic sub-unit, surrounded by a second proteic sub-unit, the term semivirus could be advanced for indicating viral bodies lacking any proteic coat. Incidentally: here, the linguistic pure form semivirus (Latin-Latin) has been preferred to the hybrid form hemivirus (Greek & Latin).

O. VIROMICROSOME, VIROSOME AND VIROLIPOSOME

The term viromicrosome, which literally means «viral small body», has been coined, in the old days of myxovirus research, by Rott & Schäfer (1961) and qualified as follows: «*Die Inkompletten Formen der Influenza-*

Viren stehen den infektiösen Viruspartikeln wesentlich näher als die 'Viromikrosomen'». These cell homogenates, containing microsomal membranes, were visible at the electron microscope as amorphous masses without any indication of a virus-like particle (see also Rott & Schäfer, 1964).

Unexpectedly, the term viromicrosome had been widely overlooked by the virological literature (however, the Dorland's Medical Dictionary [2000] quotes the term viromicrosome as follows: «viromicrosome, a name sometimes applied to an incomplete virus particle released by premature disruption of the host cell»). By contrast, after 1975, a linguistically simplified form of viromicrosome, that is virosome, became largely quoted in virological papers and shortly acquired an increasing medical relevance (vaccine immunogenicity and vaccine technology).

The term virosome, which only means «viral body», was, first, proposed by Dahl & Kates (1970) as follows: «Since viral DNA complexes are quite poorly defined biochemically it seems appropriate to refer to such structures by the general term «virosomes» (viral body), in analogy with chromosomes, in order to avoid more restricted nomenclature (*e.g.*, viral DNA, DNA «factories», *etc.*), which may, in fact, create a misleading impression concerning their composition and function».

Almost contemporaneously Kára *et al.* (1971) re-proposed virosome to define «oncogenic subviral ribonuclein particles ('virosomes')». Unexpectedly, neither Dahl & Kates (1970) nor Kará *et al.* (1971) mentioned the papers of Rott & Schäfer (1961, 1964).

Surprisingly, all papers quoted above were so widely ignored or, at least undervalued by virologists, that Almeida *et al.* (1975), in a paper published in the *Lancet*, reinvented the term virosome, as follows: «The surface haemagglutinin and neuraminidase projections of influenza virus were removed from the viral envelope, purified, and relocated on the surface of unilamellar liposomes. The resulting structures were examined in the electron microscope and found to resemble the original virus. Units of both the viral haemagglutinin and viral neuraminidase could be discerned. The name virosome is proposed for these new bodies», cf. Almeida *et al.* (1975, p. 899).

Today, the term virosome is recorded by all main scientific dictionaries, and despite its literal meaning («viral body») it is always qualified as a modified liposome, cf., for instance, Mahy's (1997) Dictionary of Virology, «*virosomes*. Liposomes with viral proteins on their surfaces...», and Singleton and Sainsbury's (1996) Dictionary of Microbiology, «*virosome*. A LIPOSOME which incorporates viral (usually ENVELOPE) proteins».

The present notable importance and great medical interest for the virosomes, is the automatical consequence of the increasing use and technical development of the liposome researches, cf. literature in Morein & Simons (1985), Glück (1995: «liposomology»; 1997), Glück & Wegmann (1998) *etc.*

For the sake of terminological accuracy, it is necessary to emphasize that the present virosomes are nothing else than *liposomes secondarily modified* by the incor-

poration of viral matter. Therefore, they should be more adequately termed viroliposomes.

P. PROVIRUS AND INTEGRAVIRUS

The term provirus has been first proposed by Temin (1963, 1964, 1970, 1971). Today, most medical dictionaries record the entry provirus as follows:

- «The genome of an animal virus integrated (by crossing over) into the chromosome of the host cell», cf. Dorland's Ill. Med. Dictionary (2000).
- «The viral genome integrated as DNA into the cell genome with which it replicates», cf. Mahy's Dictionary of Virology (1997).

From a linguistic point of view, it is worth recalling that the prefixes sharing the meaning «before», «prior to», «earlier than» are *pre-* (from the Latin *prae-*) and *pro-* (from the Greek *πρῶ-*).

Since virus is a Latin word, the derivative *previrus* is the pure form whereas *provirus* is the hybrid form. In this case, euphonic convenience together with the wider utilization of the prefix *pro*, favoured the coining of *provirus*.

Actually the term provirus is rather vague because all components of a virus, can be recognized to be a provirus particle. Considering, for instance, the retroviruses, the viral RNA (a dimer of positive single-stranded RNA) is transcribed into a circle of double-stranded DNA, the present provirus, so that a real genomic integration takes place into the chromosomal DNA of the host cell. Such an integration gives rise to a singular type of, let us say, viromeric chromosomes, which might be defined viromerichromosomes, that is chromosomes consisting of both chromomeres and viromeres. In any case, as regards a more appropriate term to define an integrated virus genome, the word integragenovirus or shorter integravirus, seems to the writer more appropriate than the present provirus. As regards modern evaluations of the proviruses, see, e.g. Hannon *et al.* (1999) and Stoye & Coffin (2000).

Q. CAPSID, NUCLEOCAPSID AND PROCAPSID

Lwoff *et al.* (1959, p. 288) described «The viral infective system..., the *virion*... as a clathrate type of compound in which the genetic component is enclosed in a coat or *capsid* formed of subunits or *capsomeres*».

They coined the terms *capsid* and *capsomeres* on a Greek basis, that is «(de *Κάψα*. boîte. et de *μερῶς*. partie: parties de la boîte)» (incidentally: the Latin dictionaries quote the corresponding nouns «*capsa*», «*capsula*» and «*capsella*»).

Since the capsid is not an inert container of a viral genome (virogenome), nor regularly displays a capsular shape, the term *capsoid* (i.e. capsule-like) is more appropriate than the present *capsid* (as regards recent literature on capsid, see e.g. Gamble *et al.*, 1997 and Peters & Sikorski 1999). There is, also, the question of compound and derivative terms such as nucleocapsid and procapsid.

The term nucleocapsid has been coined by Caspar & Klug (1962, p. 2): «These are the primary packages of the infectious nucleic acid, or as we should now say, *nucleocapsids* (see Proposals, Caspar *et al.*, this volume)», see also Caspar *et al.* (1962, p. 49): «The virion is either a naked or an enveloped nucleocapsid».

Since capsid stands for coat or envelope, nucleocapsid means the envelope of the nucleus. Now, the prefix «nucleo», in cytology, refers to «cell nucleus» and not to «nucleic acid». Thus *nucleocapsid* (or *nucleocapsoid*) cannot be accepted as terms referable to the organization of viruses.

Such a linguistic misuse of the prefix *nucleo-* is not new and the term *nucleofilament*, again proposed by Finch & Klug (1976), see below, can be quoted. As regards this question, I must recall that some authors, cf. Lawrence, 1977, Rattle *et al.*, 1979, describe the occurrence of sub-units of the nucleosomes or *nucleosome filaments* as the *nucleofilaments*. This term has been first proposed by Finch & Klug (1976, p. 1897) as «a flexible chain of repeating structural units of about 100 Å diameter ... We call this close-packed chain a *nucleofilament*». Since, linguistically, nucleofilament means nuclear thread, that is chromosome or chromonema, such a term cannot be reasonably reutilized in describing the organization of chromatin, see criticism in Battaglia (2000).

Moreover, the current definition of nucleocapsid clearly deserves consideration. The Oxford Dictionary of Biochemistry and Molecular Biology (1997) quotes: «*nucleocapsid* the structure within a virus that comprises the proteinaceous capsid and the genomic nucleic acid». Such a definition suggests *genocapsoid* in place of nucleocapsid. The Dictionary of Virology by Mahy (1997) records (p. 227): «*nucleocapsid*. The viral nucleic acid directly enclosed by the capsid. This simple arrangement is usual in ... but with most animal viruses the capsid encloses a more complex structure, the core», and further (at the page 55) «capsid and core together form the nucleocapsid». Almost automatically, this last sentence suggests *corecapsoid* in place of nucleocapsid.

We have now to consider *procapsid*, a term which has been coined by Jacobson & Baltimore (1968, pp. 369, 377), as follows (p. 377): «The role of top component as the protein precursor of the virion suggests the need for a more functional name for this particle. Following a suggestion of Dr. André Lwoff, we propose the name *procapsid*» (p. 369): «that it is thus a true precursor. In light of these results it is proposed that the name *procapsid* be used for this particle. The final step in virion synthesis, then, is the aggregation of viral RNA with the *procapsid*».

Apart from any evaluation of modern biochemical details which suggested expressions such as «open *procapsid*», «closed *procapsid*» and «degraded *procapsid*», cf. Dokland *et al.* (1997), McKenna *et al.* (1992, 1994) *etc.* the author considers *procapsoid* better than *procapsid*.

R. ENVELOPED AND NAKED VIRUSES

There is the need of a couplet of terms apt in order to define the alternative «naked or enveloped» state of viruses.

The couplet «naked & enveloped (capsid)», has been used first by Caspar *et al.* (1962) and by Lwoff *et al.* (1962).

Given that virus is a Latin noun, it is worth recalling that there are several Latin terms which convey the concept of outer covering or envelope, namely chlamys, peplos (peplum), tectum, theca, toga and tunica.

Three of these terms have already been adopted by taxonomists dealing with viruses, so that they cannot be re-utilized. They are: chlamys (cf. genus Chlamydia-microvirus), tectum (cf. genus Tectivirus, fam. Tectiviridae) and toga (cf. fam. Togaviridae).

A fourth term peplos (from the Greek πεπλος, ον) has already been proposed to indicate the virus envelope by Lwoff & Tournier (1966). These authors write (p. 67): «The following 4 characters of the virion shall be used for the definition of families ... III - The presence or absence of an envelope for which the name *peplos* is proposed. A peplos is formed of *peplomers* just as a capsid is formed of capsomers».

The last remaining terms, theca and tunica have not been advanced nor proposed by virologists. They will be taken into consideration after the following discussion of the term peplos as quoted above.

Apart from the minor consideration that the couplet peplovirus (enveloped) & apeplovirus (naked) has not been advanced to signify the occurrence or the absence of an envelope, the term peplos refers to a rectangular garment (open shaped or Ionic) as well as tubular (close shaped or Doric), worn by ancient Greek women (more details and related references in Pekridou-Gorecki 1989).

Indeed, there is no concrete morphological correspondence between such Greek female cloth and the shapes, structures and organization of the polymorphic envelope of viruses. This may well account for the lack of the term peplos in the present virological literature (see, *e.g.* Fields Virology 1996).

We will discuss now the last two terms, that is theca and tunica. The Latin term theca basically shares the concept of box (cf. «theca nummorum» of Cicero) and in the Latin language does not appreciably differ from the synonyms capsula and capsula. In contrast to the terms recorded above, the remaining Latin term tunica shares the meaning of cover in a wider sense, extending from the meaning of cloth to that of natural covering of parts of animals and plants. Consequently, the author believes that the couplet tunicavirus & atunicavirus can be advanced as an alternative to the current couplet enveloped & naked viruses.

However, the origin, the shape and the organization of the viral envelope suggests a more intrinsic consideration of this nomenclatural question. Almost all enveloped viruses build their envelope, namely an outermost bilayer lipid membrane, with associated proteins, by budding through plasma membranes in many cases, or, in other cases, through nuclear membranes. Usually,

the lipid components of the envelope are derived from host cell membranes, while the proteic components are virus-encoded and may also project from the surface of the envelope as spikes. In addition, in some enveloped viruses, the internal structures assemble as part of the budding process. Thus, both shape and function of the viral envelope show the occurrence of a general pattern rather different from that of an inert simple covering. Given that the virus envelope reveals an active and plastic role like a skin, this consideration automatically evokes the Latin noun cutis and the compound term cutivirus. This linguistically pure compound term is also simpler than the corresponding hybrid derivative dermatovirus, from the Greek δερμα, τοζ. Accordingly, the author believes that in a general revision of the present virological terms, the couplet cutivirus & acutivirus should also be considered as an additional proposal to distinguish between enveloped and naked viruses.

S. THE PRESENT VIROLOGICAL TAXONOMY: A FEW LINGUISTIC CONSIDERATIONS

From the linguistic point of view, this account cannot avoid to take into consideration the present virological taxonomy, cf. *e.g.* Fields Virology (1996). This taxonomic system is based on the etymological acceptance of the stem *vīr-*, from *vīrus*, and accordingly the orders of viruses are qualified *vir-ales*, the families *vir-idae* and the subfamilies *vir-inae*. Since this is a system Latinized, the author believes to be pertinent the following comments:

- the endings (*vir*)ales and (*vir*)inae should be recognized as *vīr-* derivatives and consequently both adequate to qualify orders and subfamilies, respectively;
- as regards the family ending into (*vir*)idae, there is a literal coincidence with the Latin adjective *viridis*.

Now, it is quite evident that owing to this linguistic coincidence, the *viridae* qualification is ambiguous as well as misleading.

To propose an improved system is, indeed, a difficult task. However, the author, having already advanced *virosa* (nom. pl. of *virorum*) in place of *vira* (see Chapter D, phylum *vira*), would suggest *virales* in place of *virales*, *viridae* in place of *viridae* and *virinae* in place of *virinae*.

T. THE PRESENT VIROTERMINOLOGICAL SYSTEM

There is no doubt that for the sake of preserving a desirable and useful linguistic uniformity, the term virology should have an important planning influence and should also serve as guide for the coining of new terms. At the same time, it should also act as a criterion for re-evaluating the terms already coined.

Virology is unanimously accepted and interpreted as *vir(us) + o + logy*, that is the stem *vīr-* followed by the connecting vowel *-o*. Consequently, for the sake of linguistic homogeneity, the following terms should be discarded from the virological literature:

- all terms having a connecting vowel other than -o as vir-u-cide, vir-i-cide and vir-u-static (to be replaced by the corresponding viroicide and virostatic);
 - all terms which include the nominative case virus as virus-cide, virus-emia, virus-oid (to be replaced by the corresponding viroicide, viremia, viroid), virology (virusologia of the Russian literature) *etc.*
- As the maintenance of the comb. form viro- is the only way to establish a sound terminological system referable to the term virus, the following terms, already coined and often quoted by the scientific literature, could be recognized as regular members of the linguistically homogenous viroterminological system recommended by the author:
- viroceptor, cf. Upton *et al.*, 1991;
 - virogeny, cf. Koprowsky, 1964 (This author does not mention analogous earlier terms such as virogenic [stroma] cf. Xeros [1956] or virogenetic [stroma], cf. Huger & Krieg [1960, 1961]);
 - virokine, cf. Kotwal & Moss, 1988;
 - virolactia, cf. Stagno & Cloud, 1994;
 - virolysis, cf. Almeida & Waterson, 1969;
 - viropexis, cf. Fazekas de St. Growth, 1948;
 - viroplasm, cf. Johnson, 1940: «viroplasm theory»; Johnson, 1942, p. 443: «suggested by Dr. H.H. Whetzel of Cornell University». See also viroplasm and viroplasmic foci in Dales, 1963, 1965; Carrasco *et al.*, 1993;
 - viroplast, cf. Mach & Kàra, 1971;
 - viroporin, cf. Carrasco *et al.*, 1993;
 - virosis, cf. Jones L.R., 1925 cited by Folsom, 1927. See also virosico in Migliorini, 1950, virotico in Migliorini, 1963.
 - virotoxin, cf. Buku *et al.*, 1980.

CONCLUSIONS

The author believes that the present collection of terms, analytically commented from both the historical and the linguistic points of view, may well represent the basis for achieving a sound terminological system for the modern Virology.

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