**Etymology of Main Polysaccharide Names**

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**Abstract**

This chapter deals with the etymology and history of names of the main polysaccharides and of some of their constitutive saccharides. The considered languages are mainly those which are used by the 16 academic EPNOE members, which are also the founders of EPNOE Association. Most of these nine languages belong to the Indo-European family (which includes also Greek and Latin), and they are distributed among the Germanic group (English, German, Dutch, Swedish), the Roman group (French, Romanian), and the Slavic group (Polish, Slovenian). Among the nine languages, the only non-Indo-European one is Finnish, which belongs to the Finno-Ugrian family.

**2.1 Introduction: Etymology**

Etymology studies the origin and history of words. The interest of this approach lies in the fact that the etymology (from Greek *etumos* “true”) of a given word generally tells something about the reality which lies under this word. The present chapter deals with the etymology of the names given to the main saccharides and polysaccharides consumed and used by people.

For instance, the common name of a chemical substance is often related to the name of a plant from which the substance has been first isolated. That is true for saccharides like *sorbose* or
rhamnose. The name of a substance can also be related to a specific part of plants, like cell wall for cellulose or fruit for fructose. In other cases, it can be related to an animal component, like liver for heparin, insect carapace for chitin, and milk for lactose and galactose. However, the link between the substance and its name can be quite different when it involves a particular property, like sweetening for glucose, stiffening for starch, and thickening for pectin. In any case, the common names of polysaccharides as chemicals are officially retained by IUPAC organization. Besides the names of some important mono or disaccharides, the complete list of which is huge, the following chapter will insist more on the well-known polysaccharides: cellulose, starch, chitin, carrageenan, inulin, pectin, heparin, and pullulan.

Let’s begin this exploration with the name polysaccharide itself.

### 2.2 Saccharide and Sugar: One Origin for Two Synonyms

A polysaccharide is a polymer (from Greek polu “many” and meros “part”). A monomer is made of only one part, a dimer of two parts, and a polymer of many parts. Polysaccharides are sometimes called polymerized sugars. In other words, saccharide and sugar are roughly synonyms: the former being a scientific term, while the latter is also used in chemistry (for instance, in the phrase sugar unit) but mainly in common language, for ordinary table sugar in tea or coffee.

- The word (or element) saccharide is made of sacchar-, which means “sugar,” and the suffix -ide (from Greek eidos “species”), which indicates the belonging to a family: a saccharide is a molecule of the family of sugars. It is the same name as English in German and French and nearly the same in Dutch (sacharide), Swedish (sackarid), Finnish (sakkaridi), Polish (sacharyd), Slovenian (saharid) and Romanian (zaharid).
- Both saccharide and sugar are derived from Sanskrit çarkara- “gravel,” and later “sugar” (originally, granulated sugar):

  - Saccharide was recently derived, in scientific language, from the Latin word saccharum, continuing Greek sakkharon, which was the name of a product imported from India during antiquity. As a matter of fact, this product was something like cane sugar used only in small quantities and mainly for medicinal uses. At that time in Europe, the general way of sweetening food and beverages was with honey.

  - Sugar was derived, through Old French, from Arabic sakkar, when the cultivation of sugar cane was introduced in southern Europe by the Arabian agronomists around the Middle Ages. Indeed, Arabic sakkar is, directly or indirectly, the origin of most European names for sugar, like Spanish azucar (from Arabic al sakkar “the sugar”), Italian zucchero, itself continued by German Zucker, Swedish socker, or French sucre, while English sugar and Dutch suiker are derived from Old French. We recognize the same Arabic origin in Polish cukier and Finnish sokeri (borrowed from Swedish), while in Romanian, zahăr is related to Modern Greek zakharè “sugar”.

  N.B.: the Slovenian name sladkor “sugar” as well as the verb sladkati “to sweeten” belongs to a Balto-Slavic family of words (including Polish słodki “sweet”) related to the Old Norse saltir “seasoned, salted” (Buck 1988), itself related to the Indo-European root meaning “salt.” This shows that seasoning can be done with salt or with sugar!

#### 2.2.1 Sugar, Saccharide, or -ose

We know monosaccharides, like glucose, disaccharides, like lactose, and polysaccharides, like cellulose where we see the suffix -ose, which is still another way for designating a sugar or a sugar derivative. This suffix comes from the name glucose itself, attested in a French publication in 1838. The decision has been to name the other sugars after glucose, like fructose (from Latin fructus “fruit”), lactose (from Latin lac, lactis “milk”), galactose (from Greek gala,
galactos “milk”), etc. Glucose, fructose, lactose, galactose, etc., were called ose in French, the word ose itself becoming another synonym for sugar and saccharide. Then polyose will be roughly a synonym of polysaccharide. But we still have to explain glucose.

2.2.2 Mildness, Sweetness in Chemistry

The name glucose is borrowed from the Greek name gleukos meaning, in Aristotle’s works, “mild wine” or, in a figurative sense, “mildness.” Then, gleukos itself is derived from the Greek adjective glukus “mild, sweet, delicious” in the literal as well as the figurative sense. From these names, we have many derivatives with the prefix glyc(o)– or gluc(o)–.

- The prefix glyc(o)– is used for a sweet substance, like glycin itself, or glycerin (made from the Greek adjective glukeros, nearly a synonym of glukus), and then derivatives like glycol.
- The prefix glyc(o)– or gluc(o)– represents glucose or any glucose-like molecules; for instance (cf. terminology in Chap. 3):
  - Glycan, as a synonym of polysaccharide, or oligosaccharide, is made only of sugar units.
  - Glycogen is a polymer of glucose, which can deliver (generate) glucose.
  - But glucan is a polysaccharide made only of glucose units, like cellulose and starch for instance.
  - In French food terminology, glucide is the word for carbohydrate.

To conclude this paragraph, we can say that glucose is a sort of pleonasm because gluc– means “sweet, mild as sugar” and, in chemistry, suffix -ose is a synonym of sugar! In the same way, the name saccharose (or sucrose) is a pleonasm as well!

2.3 A Large Variety of “-oses”

Starting from glucose, the suffix -ose is added, for designating different sugar units, to several elements related to:

- A chemical structure as for hexose (six carbons) and pentose (five carbons), or aldose (aldehyde function) and ketose (ketone function)
- An optical activity as for dextrose (Latin dexter “right”) and levulose (Latin loevus “left”)  
- And, more frequently, the vegetal or animal origin of the molecule, as in fructose, lactose, and galactose already mentioned, or xylose (Greek xulon “wood”), maltose (from malt), and fucose (from Latin fucus “red alga”).

The name sorbose is derived from the genus name Sorbus of several plants like sorb trees or rowans (Fig. 2.1).

The rhamnose was isolated from the buckthorn, a plant belonging to genus Rhamnus, created by Linnaeus in 1753 after the Greek name of this plant, rhamnos (Fig. 2.2).

The origin of apiose is not obvious. Could it be Latin apis “bee”? Indirectly yes, since the apiose has been extracted from parsley, and then apiose comes from Latin apium “parsley.” But Latin apium originally is the name of celery, so named from apis “bee,” because it was considered in antiquity as the herb of bees.

The origin of mannose is still more enigmatic: it comes from manna, the Hebraic name in the Bible for the miraculous food appearing in the desert but, in reality, a sweet secretion provided by some trees or bushes in favorable conditions.

Arabinose was extracted from gum arabic, an excretion of several species of Acacia, mainly in
Arabic-speaking regions of northern Africa. Later on, the name ribose was used (in 1892) for a new isomer of arabinose, the change of letters from arabinose to ribose being a sort of literal representation of the chemical isomerization (likewise, in the same period, an isomer of xylose was named lyxose).

In the following decade, researchers of the Rockefeller Institute of Biochemistry (RIB in New York City) showed the crucial role of ribose in the chemistry of life (as part of ribonucleic acid or RNA). By chance, the initials RIB could then also be read in ribose.

We come now to a polymer of "-oses" of major importance.

2.4 Cellulose

Roughly speaking, cellulose is polymerized glucose, and this is the reason of the suffix -ose of cellulose. The first part of the name means that this natural polymer is an important constituent of vegetal cells, namely, the main constituent of cell walls. The French name cellulose is originally attested in a botanic course of Antoine de Jussieu in 1840, after French cellule "cell," derived earlier from Latin cellula "small room," diminutive of cella "room" (the etymology of which is perhaps related to the Latin verb celare "to hide"). In other Roman languages, the name of a cell is also linked to the Latin diminutive cellula, like Italian cellula, Spanish célula, Romanian celulă, but in other languages, the name comes directly from cella: English and Swedish cell, German Zelle, Dutch cel, as well as in Finnish solu or Polish cela (Slovenian is different with the diminutive celica "cell"). Nevertheless, in all languages, the name of cellulose is equivalent to the French word: Italian cellulosa, Spanish celulosa, Romanian celulosă, as well as English cellulose, German Zellulose, Swedish cellulosa, Dutch cellulose (besides celsot, which, in Dutch, means "constituent of cell"), Polish and Slovenian celuloza, and Finnish selluloosa.

Now, before coming to starch, the other important natural polysaccharide in terms of volume, let’s examine different ways of expressing sweetness in European tongues.

2.5 Indo-European Representation of Mildness or Sweetness

We have seen the Greek adjective glukus “mild, sweet.” Its Latin equivalent is dulcis, becoming dulce in Spanish, dolce in Italian, or édulcorant "sweetener" and doux "mild" in French. Can we relate glukus to dulcis? Yes, if we consider (Ernout and Meillet 1985) the probable existence of an Indo-European root, *dluku-, and if we admit that its initial d becomes g in Greek (by attraction of k, since g is closer to k than d) while the element -lu- of *dluku- becomes -ul- in Latin (in linguistics, such an exchange of letters is called metathesis, and it happens that the same word, metathesis, designates a chemical reaction exchanging one atom group of one molecule with one atom group of another molecule). However, we see that English sweet is quite different, as well as mild. First, we have another Indo-European root, *swad- "mild, pleasant," which explains:

- English sweet, German süß, Dutch zoet,
  Swedish söt
• But also Latin suavis “mild, pleasant,” then suave in French, borrowed as such by English, soave in Italian, more in the figurative meaning.

Now, we have to deal with the adjective mild, which belongs to a completely different family of words.

2.5.1 From Millstone to Mildness?

As a matter of fact, there are connections (Onions 1992), even if they are not firmly established, between:

• Greek μυλός, Latin mola “millstone,” Latin verb molere “to grind, to mill,” then in English to mill, and result of milling which is meal “flour,” like in wheatmeal, for instance (nothing to do with meal “lunch or dinner”, which is related to measure), and in Dutch meel “meal, flour” and in German Mehl “flour.”

• Latin mollis “soft,” because a milled product is no longer hard, then French mou “soft” and mild “not hard,” in English as well as in German, Dutch, and Swedish.

• The Germanic root represented by English to melt “to become liquid” (and the variant to smelt “to fuse” in metallurgy, Dutch smelten “to melt,” German schmelzen “to melt”) since both melted and milled substances are fluid.

• Finally, English malt (then French malt, German Malz, Dutch mout) has something to do with melt, since the malt is produced by a digestion of barley grains in water, resulting in a sort of syrup.

In this process, barley starch is depolymerized by amylase: this leads us to the history of starch names in different languages.

2.6 Starch

2.6.1 Starch in Greek, Latin, and Roman Languages

This product was named amylum in classical Latin, itself borrowed from Greek amulon, coming from amulos, the first meaning of which is “not ground, not milled.” Indeed, amulos is made (Chanteraine 1990) of the privative prefix a- “without” and the name mule “millstone.” The reason of this etymology is that starch was prepared with fresh grains, without any milling, as opposed to flour. Pliny the Elder (first century), in his Natural History (Liber XVIII, 76), explains it as follows: “The invention of starch happened in Chios island, and still today the most estimated one is coming from there. It is so named because it is prepared without the use of any millstone.” Of course, the production of starch has been much improved all along times: some crushing or grinding of the grains has been added in the process, and even milling, since the wheat starch can be produced today from flour. Nevertheless, the etymology of Latin amylum derivatives retains the footprint of the ancient process. In the medieval period, this name amylum was altered to amidum, whence the names of starch in Roman languages, like French and Romanian amidon, Italian amido, or Spanish almíndon.

Let’s make two remarks:

(1) The late Latin word amidum “starch” has nothing to do with the much more recent name amide. While amidum must be understood as a + midum, the name amide is made of am + ide, where am- is the beginning of ammoniac, since a molecule of amide is built around an atom of nitrogen. In the scientific nomenclature, no confusion can happen with amide since the starting point for expressing a relation with starch remains classical Latin in the prefix amyl(o)-, like in amylose, amylase, amyloplast, or, in French, amylace “starchy.”

(2) Amyl- is also synonym of pentyl-, like in amyl alcohol, probably because this alcohol can be produced from starch.

But then, what is the origin of starch in English, which is so different from the Latin form?

2.6.2 Starch in Germanic Languages and in Finnish

The English name of starch, as well as its equivalent in German, Stärke, or in Swedish, Stärkelse,
is not related, as in Greek, to its manufacturing process but to its utilization. As a matter of fact, those names are related to the same Indo-European root as the adjective stark, in English “rigid, stiff” and in German and Swedish “solid, resistant,” and this relation is due to the stiffness which is given to fabrics and clothes by the application of starch. Even more unexpected, the name of a famous bird, the stork in English and Swedish, Storch in German, is related to the same Indo-European root, just because this bird, so elegant while flying, looks stiff when it is landing and then walking on its nest. The name of the stork is totally different in Latin (ciconia, probably an onomatopoeic name, for this clattering bird), and then in the Roman languages (as cigogne in French). Coming back to starch, its name in Finnish, tärkelys, is borrowed from Swedish stärkelse, with the fall of the initial s (cf. Tukholma, the Finnish name of Stockholm). Even if Finnish is not a Germanic language, and even not an Indo-European language, many borrowings happened between Finnish and Swedish all along the history of Finland.

N.B.: In this case, the Dutch names (van Veen 1989) are completely different from other Germanic languages:

- Zetmeal “starch” is made of zet-, meaning “making thick, setting,” which is logical for starch in food use and of -meel “meal, flour,” but the other Dutch name stijfseel “starch for nonfood use” is a derivative of stijf “stiff,” which is logical for a stiffening product.
- Ooievaar “stork” is somewhat isolated and originally means “bringing luck.”

### 2.6.3 Starch in Slavic Languages

The name of starch in Polish, skrobia, comes from the verb skrobać “to scrape,” because starch has been produced from grated wheat grain and later on from grated potato or maize. In Slovenian, the name škrob “starch” is of the same origin. After cellulose and starch, a third important polysaccharide is chitin.

### 2.7 Chitin

The name chitin is attested (chitine in French in 1821) for designating the main constituent of the carapace of insects. This name, with the suffix -in, comes from Greek khitōn, which was used, in secondary meanings, for naming hard envelopes in anatomy and in botany.

This Greek name itself, probably of Semitic origin, designated originally a sort of tunic, generally short for men and long for women, still named chiton (in French too) in texts relating to antiquity. However, this Greek word took several derivates and other meanings, such as any item of clothing, an armored coat for a soldier, and, as we just said, the skin of animal organs, of snakes, or of fruit, or else the cork of some trees or the shell of mollusk shellfish.

Today, it is well known that chitin is the main constituent of carapace, not only of insects but of all arthropods, including particularly crustacean shellfish, and that it is also the main constituent of cell walls of fungi. Chitosan is obtained from chitin by partial deacetylation, resulting in the fact that chitosan is water soluble while chitin is not.

### 2.8 Other Polysaccharides

The last paragraph of this chapter will deal with the names of the following polysaccharides: carrageenan, inulin, pectin, heparin, pullulan, hyaluronan, murein, and levan.

#### 2.8.1 Carrageenan

Carrageenan is extracted from red seaweed known under the common, and misleading, name of Irish moss or carrageen moss or curly moss (Fig. 2.3).

This English name carrageen (in French carragheen) probably comes from the old names (Carrageen, Carraghcaen) of the city now named Carrigeen (originally, in Irish Carraigin,
which means “little rock,” from carraig “rock”). This city is located near Waterford, on the south-east coast of Ireland, a region where this Irish moss was historically cropped and exploited for producing a sort of vegetal equivalent of the animal gelatin.

N.B.: There is another product similar to carrageenan: the agar or agar-agar (from its Indonesian or Malayan name), which is also extracted from a red seaweed. Purified agar-agar is a polysaccharide called agarose.

2.8.2 Inulin

Inulin is extracted from a large yellow-flowered plant called elecampane in English (Fig. 2.4). Since antiquity, this plant has been known for its medical properties. Pliny the Elder describes it under the name inula, itself derived from Greek helenion, which designates a plant supposed to be dedicated to the legendary, famous, and beautiful Helen of Troy. Namely, helenion was borrowed in primitive Latin as elena, or enula, due to the permutation of l and n (i.e., metathesis, as mentioned earlier in this chapter), and then inula in classical Latin. At the same time, elena (alena) evolved to auneé in French, alant in German and Dutch, eolone in Old English, and elecampane in Modern English, with Latin campaneus “living in the fields.”

In 1753, Linnaeus established the genus Inula and named its main species Inula helenium, combining the Greek and Latin names. The name inulin is of course derived from Inula, with the suffix -in.

2.8.3 Pectin

This polysaccharide is known for its jelling properties, particularly in the composition of jams and jellies. Its name is made of the suffix -in after the element pect-, itself derived from the Greek adjective pēktos “coagulated,” related to the irregular verb πέγνυμι “to stick in, to fix, to solidify.” In the same family, there is the adjective pēgos “compact, thick.” It is interesting to note that the root peg- or pek- is also present in Latin words with the adjective compactus “compact,” from the verb pingere “to stick in, to fix, to solidify” in the literal as well as the figurative sense, and even with the verb pacere “to pacify” in relation with pax, pacis “peace” because peace, thanks to a pact, brings stability and solidity to a human community. What a surprising semantic link between pectin and peace!
N.B.: In Dutch, pectin is called *pectine*, or *geleisuiker*, made of *gelei* “jelly” and *suiker* “sugar.” The name *jelly* or *gel* (cf. *gelatin*) comes from the Latin verb *gelare* “to freeze,” because of the analogy between solidification of water by freezing, resulting in translucent ice, and its solidification by gelling, with pectin, for example, resulting in some soft translucent gel. The link between the two concepts remains transparent in Roman languages, as in French where there are the following homonyms: *gel* “frost” and *gel* “gel, jelly.” But this link is not obvious in a language where the verb meaning “to freeze” is not related to Latin *gelare*.

### 2.8.4 Heparin

This product has been discovered in extracts of liver showing antithrombosis effect. It is the reason why *heparin* is composed of the suffix *-in* after the element *hepar*, *hépatos* “liver.” However, the link between *heparin* and the name of liver is only historical since this polysaccharide is present in many organs and is produced today from other animal organs than liver.

**About Liver:** The designation of this organ is another case where we find very different names in all Europe. Greek *hépar*, like Latin *jacur*, belong to the same Indo-European origin, linked to the role of this organ in religious prediction, while Polish *wa˛troba* and Slovenian *jetra* are related to Greek *entera* “entrails.” But English *liver*, German *Leber*, and Dutch and Swedish *lever* are probably related to the Greek *lipos* “fat,” perhaps because of the *foie gras* of goose, which was already popular in antiquity. This link between foie gras and the name of liver is still more certain in Roman languages: Italian *fegato*, Spanish *higado*, French *foie*, and Romanian *ficat* are all derivatives of Latin *ficatum* “foie gras,” from *ficus* “fig, fig tree,” because, already in ancient Greece, the geese were force-fed with figs, and also because liver was often cooked with figs. Even in Modern Greek, *sukôti* “liver” comes from *suko* “fig.”

Let’s end this list with the Finnish *maksä* “liver,” which is linked to a very old Finno-Ugrian root (cf. Hungarian *máj* “liver”) (Häkkinen 2007).

### 2.8.5 Pullulan

It is a polysaccharide which is produced from starch by a yeastlike filamentous fungus named *Aureobasidium pullulans*. The species name *pullulans* means “pullulating,” from the Latin verb *pullulare* “to pullulate,” because this fungus does pullulate in various environments. Then *pullulan* comes from a species name, unlike the different names seen until now, derived from a genus name, like *Sorbus*, *Rhamnus*, or *Inula*.

### 2.8.6 Hyaluronan, Murein, and Levan

These three last polysaccharides are also dealt with in Chap. 3:

- *Hyaluronan* is made of Greek *hualos* “glass,” because this molecule is present in the vitreous humor of the eye and of *uronic (acid)* from Greek *ouron* “urine.”
- *Murein* is a derivate of Latin *murus* “wall” (cf. French *mur* “wall”), because this molecule is present in cell walls of specific bacteria.
- *Levan* is made from Latin *laevus* “left,” as opposed to *dextran*.

### Conclusion

The huge biodiversity on the earth is partly visible in the large diversity of saccharides and polysaccharides which are provided by nature. The names of these products are linked to their natural origin, to their properties, or to some elements of their history, generally going back over antiquity. Apart from the case of starch, most of these names are very similar in all languages since they are generally derived from the same Greek or Latin words. For instance, the vernacular names of liver are quite different in different languages (*liver, foie, ficat, wa˛troba, maksä*), but the
name of heparin remains the same, or nearly the same (heparin, héparine, heparina, heparyna, heparini), since it is derived from the Greek word hépar “liver.” Another example is the name of inulin, derived from the genus name Inula of a plant, regardless of the vernacular names of this plant, which are quite varied in Europe. Unfortunately, the Greek and Latin languages are less and less present in the education programs of European countries, but fortunately, they remain a sort of Esperanto, very useful for international communication in many scientific fields.

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References
van Veen PAF (1989) Etymologisch woordenboek, Van Dale, Utrecht/Anvers
The European Polysaccharide Network of Excellence (EPNOE) Research Initiatives and Results
Navard, P. (Ed.)
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