

Allulose-psicose nomenclature usage.

In the early pre-1930 literature *D-ribo-hex-2-ulose*, the last of the ketohexoses to be firmly identified, was called pseudo-fructose or ψ -fructose [pseudo may be written as the Greek letter psi ψ]. Psicose as a trivial name was first suggested by Ohle and Just [1] in 1935. They explain in footnote 1 of the paper: "Statt der schleppenden Bezeichnung Pseudo-fructose möchten wir den Namen Psicose in Vorschlag bringen" which means "Instead of the cumbersome expression pseudo-fructose we would like to suggest the name psicose." Thus pseudo-or psi-fructose is shortened to psicose.

Much of the chemistry of psicose was explored by Reichstein in the Hoffman La Roche development of vitamin C in the mid-1930s. In *Helvetica*, Reichstein never referred to allulose and used psicose in the title of several papers such as: *d-Psicose* [2] and *l-Psicose (2-Keto-l-ribo-hexose, Pseudo-fructose)*, *Diaceton-l-psicose und Diaceton-l-psicuronsäure* [3]. The first papers to use allulose [4,5] claim that allulose is present in unfermentable substances in molasses. The authors say "Because of [the] relation of the ketohexose to allulose and altrose we favor the name "allulose", proposed by William Lloyd Evans at the Atlantic City meeting of the American Chemical Society meeting in September, 1941." The scientific accuracy of this claim was challenged by Hough in 1953 [6] who in this paper.

The naturally occurring nucleoside psicofuranine was reported in 1959 [7] and led to a number of papers on psicose; the name was derived from psicose as the sugar component. A series of papers by Hough reports the isolation of allulose from itea [8], the microbial oxidation of allitol to L-allulose [9], and other studies on itea [10,11,12]. Allulose is used consistently in this series of papers.

In the definitive IUPAC Carbohydrate Nomenclature, the only trivial name given for *D-ribo-hex-2-ulose* is *D-psicose* on page 1941[13]; allulose is not mentioned. In a topic search for publications on Web of Science since 1945, allulose has 25 hits whereas psicose has 473 hits - of which 145 have an address in Japan. 314 of the psicose papers have appeared since 2005. In a Wikipedia search in the UK, allulose gets directed to psicose. A search for psicose gives the hexose as the top answer but the next item is the Hitchcock film *Psycho* [<http://pt.wikipedia.org/wiki/Psycho>] where the title of the movie in Brazil was *Psicose*. All the images shown in the search are from the Hitchcock film.

Allulose has been used in papers referring to *D-allulose 6-phosphate* and associated enzymes. The following are some recent papers that have allulose in the title: (i) Competitive inhibitors of type B ribose 5-phosphate isomerases: design, synthesis and kinetic evaluation of new *D-allulose* and *D-allulose 6-phosphate* derivatives [14] (ii) 3CTL: Crystal structure of *D-Allulose 6-Phosphate 3-Epimerase* from *Escherichia coli* K12 complexed with *D-glucitol 6-phosphate* and magnesium [15] (iii) Structural basis for substrate specificity in phosphate binding (β/α)(8)-barrels: *D-allulose 6-phosphate 3-epimerase* from *Escherichia coli* K-12 [16].

Although psicose is well-established as the trivial name for *ribo-hex-2-ulose*, there is good precedent for the alternative use of allulose in both scientific and other publications.

[1] H. Ohle, F. Just, *Berichte*, **1935**, *68*, 601. [2] M. Steiger, T. Reichstein, *Helv. Chim. Acta*, **1936**, *19*, 184. [3] M. Steiger, T. Reichstein, *Helv. Chim. Acta*, **1935**, *18*, 790. [4] F. Zerban, L. Sattler, *Indust. Engineer. Chem.*, **1942**, *34*, 1180. [5] F. Zerban, L. Sattler, *J. Am. Chem. Soc.*, **1942**, *64*, 1710. [6] L. Hough, J. Jones, E. Richards, *J. Chem. Soc.*, **1953**, 2005. [7] W. Schroeder, H. HoekBema, *J. Am. Chem. Soc.*, **1959**, *81*, 1767. [8] L. Hough, B. E. Stacey, B. E. *Phytochemistry* **1963**, *2*, 315-320. [9] J. G. Carr, R. A. Coggins, L. Hough, B. E. Stacey, G. C. Whiting, *Phytochemistry* **1968**, *7*, 1. [10] L. Hough, B. E. Stacey, *Phytochemistry* **1966**, *5*, 215. [11] L. Hough, B. E. Stacey, *Phytochemistry* **1966**, *5*, 171. [12] L. Hough, B. E. Stacey, *Phytochemistry* **1973**, *12*, 573. [13] McNaught, N., *Pure & Appl. Chem.*, **1996**, *68*, 1919. [14] S. Mariano, A. K. Roos, S. L. Mowbray, L. Salmon, *Carbohydr. Res.* **2009**, *344*, 869. [15] A. A. Fedorov, E. V. Fedorov, K. K. Chan, J. A. Gerlt, S. C. Almo, *Protein Data Bank* **2009**. DOI: <http://dx.doi.org/10.2210/pdb3ctl/pdb>. [16] K. K. Chan, A. A. Fedorov, E. V. Fedorov, S. C. Almo, J. A. Gerlt, *Biochemistry* **2008**, *47*, 9608.