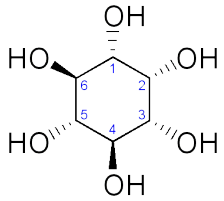
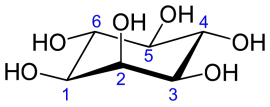
Inositol

***myo*-Inositol**[1]	
	
	
Identifiers	
CAS number	87-89-8 [2] ✓
SMILES	
Properties	
Molecular formula	$C_6H_{12}O_6$
Molar mass	180.16 g mol^{-1}
Density	1.752 g/cm³
Melting point	225-227 °C
✓ (what is this?) (verify) [3] Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)	
Infobox references	

Inositol or **cyclohexane-1,2,3,4,5,6-hexol** is a chemical compound with formula $C_6H_{12}O_6$ or $(\text{-CHOH-})_6$, a sixfold alcohol (polyol) of cyclohexane. It exists in nine possible stereoisomers, of which the most prominent form, widely occurring in nature, is ***cis*-1,2,3,5-*trans*-4,6-cyclohexanehexol**, or ***myo*-inositol** . Inositol is a carbohydrate, though not a classical sugar. It is almost tasteless, with a small amount of sweetness.

Myo-inositol plays an important role as the structural basis for a number of secondary messengers in eukaryotic cells, including inositol phosphates, phosphatidylinositol (PI) and phosphatidylinositol phosphate (PIP) lipids. In plants, the hexaphosphate of inositol is found as phytic acid. Inositol or its phosphates and associated lipids are found in many foods, in particular, in cereals with high bran content, nuts, beans, and fruit, especially cantaloupe melons and oranges.

Myo-Inositol was once classified as a member of the vitamin B complex . However, because it is produced by the human body from glucose, it is not an essential nutrient. Some substances such as niacin can also be synthesized in the body, but are not made in amounts considered adequate for good health, and thus are still classified as essential nutrients. However, there is no convincing evidence that this is the case for *Myo*-inositol.

Isomers and structure

Besides *myo*-inositol, the other naturally occurring isomers (though in minimal quantities) are ***scyllo-***, ***muco-***, **D-*chiro-***, and ***neo*-inositol**. The other possible isomers are **L-*chiro-***, **allo-**, **epi-**, *and* ***cis-inositol***.

myo- *scyllo-* *muco-* *chiro-*

neo- *allo-* *epi-* *cis-*

In its most stable conformational geometry, the *myo*-inositol isomer assumes the chair conformation, which puts the maximum number of hydroxyls to the equitoral position, where they are farthest apart from each other. In this conformation the natural *myo* isomer has a structure in which five of the six hydroxyls (the 1^{st}, 3^{rd}, 4^{th}, 5^{th}, and 6^{th} are equatorial, whereas the 2^{nd} hydroxyl group is axial.[4]

Synthesis

Myo-Inositol is synthesized from glucose-6-phosphate (G-6-P) in two steps. First, G-6-P is isomerised by ISYNA1 to *myo*-inositol 1-phosphate, which is then dephosphorylated by IMPase 1 to give free *myo*-inositol. In humans most inositol is synthesized in the kidneys, in typical amounts of a few grams per day.

Function

Inositol and a number of its mono and polyphosphates function as the basis for a number of signaling and secondary messenger molecules. They are involved in a number of biological processes, including:

- Insulin signal transduction[5]
- Cytoskeleton assembly
- Nerve guidance (Epsin)
- Intracellular calcium (Ca^{2+}) concentration control [6]
- Cell membrane potential maintenance
- Serotonin activity modulation
- Breakdown of fats and reducing blood cholesterol
- Gene expression[7] [8]

Phytic acid in plants

Phytic acid, which is **inositol hexakisphosphate (IP6)**, also known as **phytate** when in salt form, is the principal storage form of phosphorus in many plant tissues, especially bran and seeds.[9]

Inositol penta- (IP5), tetra- (IP4), and triphosphate (IP3) are also called "phytates."

Clinical implications

Psychiatric conditions

Some preliminary results of studies on high dose inositol supplements show promising results for people suffering from problems such as bulimia, panic disorder, obsessive-compulsive disorder, agoraphobia, and unipolar and bipolar depression.[10] [11] [12] [13]

In a single double-blind study on 13 patients, *Myo*-inositol has been found to reduce the symptoms of obsessive-compulsive disorder (OCD) significantly, with effectiveness equal to SSRIs and virtually without side-effects.[14] In a double-blind, controlled trial, *myo*-inositol was superior to fluvoxamine for decreasing the number of panic attacks and had fewer side effects.[12]

Patients suffering from clinical depression generally have decreased levels of inositol in their cerebrospinal fluid.[10] [11] A double-blind, placebo-controlled study of depressed patients showed that a high dose of inositol (12 grams daily) resulted in significant improvement of symptoms, with no changes noted in liver, kidney, or hematological function.[10] [11] [13] A meta-analysis of randomized trials of inositol for depression was not able to determine if inositol is of benefit. [15]

Research suggests that lithium functions primarily by decreasing myo-inositol concentrations in bipolar patients.[16] [17] Other studies suggest that lithium treatment may further inhibit the enzyme inositol monophosphatase leading to higher intracellular levels of inositol triphosphate,[18] an effect which was enhanced further by administration of an inositol triphosphate reuptake inhibitor.

Other conditions

D-*chiro*-inositol (DCI) has been found in two double-blind studies to be an effective treatment for many of the clinical hallmarks of polycystic ovary syndrome (PCOS), including insulin resistance, hyperandrogenism, and oligo-amenorrhea.[19] [20] The impetuses for these studies were the observed defects in DCI metabolism in PCOS and the implication of DCI in insulin signal transduction.[5] [21]

Animal studies suggest inositol reduces the severity of the osmotic demyelination syndrome if given prior to rapid correction of chronic hyponatraemia.[22] Further study is required prior to its application in humans for this indication.

Studies from *in vitro* experiments, animal studies, and limited clinical experiences, claim that inositol may be used effectively against some types of cancer, in particular, when used in combination with phytic acid.[23]

Common use as a "cutting" agent

Inositol has been used as an adulterant (or cutting agent) in many illegal drugs, such as cocaine, methamphetamine, and sometimes heroin.[24] This use is presumably connected with the substance's solubility and near-lack of taste (which is easily hidden by the chemical substance).

Nutritional sources

Myo-inositol is naturally present in a variety of foods.[25] According to research, foods containing the highest concentrations of myo-inositol include fruits, beans, grains, and nuts.[25]

See also

- Allo-inositol
- Cis-inositol
- D-chiro-inositol
- Epi-inositol
- L-chiro-inositol
- Muco-inositol
- Neo-inositol
- Scyllo-inositol
- Inositol 1-methyltransferase
- Inositol 3-methyltransferase
- Inositol 4-methyltransferase
- Inositol nicotinate
- Inositol phosphate
- Inositol trisphosphate
- Inositol pentakisphosphate
- Inositol hexaphosphate
- Inositol triphosphate receptor
- Inositol hexanicotinate
- Essential nutrient
- Hyperuricemia
- Hypouricemia

External links

- *Cancer Inhibition by Inositol Hexaphosphate (IP6) and Inositol: From Laboratory to Clinic* (scientific publication) [26]
- *Myo*-inositol Content of Various Foods [27]
- U.S. National Library of Medicine: Drug Information Portal - Inositol [28]

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