

Pyruvate

Pyruvate is an anion and at the same time a conjugated base of **pyruvic acid** (systematically 2-oxopropionic acid or 2-oxopropionic acid). It is one of **the basic cellular metabolites** – it is the end product of glycolysis, the product of alanine, transamination, a metabolite of fermentation processes, as well as the product of the degradation of the carbon chain of some amino acids.

Chemistry

Pyruvic acid is the **simplest** α -keto acid, due to its acidity ($pK_a = 2,5$) occurs in the cell mainly in ionized form – in the form of a conjugated base of pyruvate.

Biochemistry

Pyruvate and carbohydrate metabolism

Pyruvate is produced primarily as the final product of glycolysis. Here, pyruvate kinase transfers the **phosphate group** from **phosphoenolpyruvate** to **ADP** to form **pyruvate** and ATP. This basic reaction is the so-called **substrate phosphorylation** and represents one of the basic steps in the formation of ATP during glycolysis.

The degradation of pyruvate depends on whether the cell has a sufficient amount of oxygen available. In case of deficiency, anaerobic conversion to lactate, takes place, associated with the oxidation of the NADH. Lactate, also an acidic metabolite, acidifies the environment around it and thus places a strain on the internal buffer system.

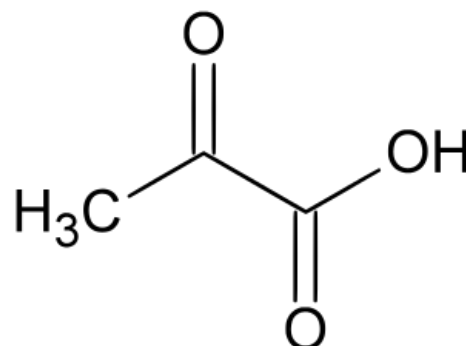
Most pyruvate is metabolized by the so-called **pyruvate dehydrogenase complex** to acetyl-CoA and carbon dioxide. However, this reaction is irreversible and so if gluconeogenesis is needed, pyruvate must be formed by other reactions. The function of this complex is very sensitively regulated by the presence of some metabolites:

- positive – AMP, ADP, pyruvate
- negative – ATP, GTP

It plays a significant role in gluconeogenesis. The enzyme pyruvate carboxylase carboxylates pyruvate to oxaloacetate. Oxaloacetate is converted to phosphoenolpyruvate (part of both gluconeogenesis and glycolysis).

Pyruvate and amino acid metabolism

Transamination of pyruvate produces alanine. Pyruvate is the end product of carbon chain catabolism of the amino acids cysteine, serine, glycine, threonine and alanine.



Chemical formula – pyruvic acid

Links

Related articles

- Pyruvate dehydrogenase
- glycolysis
- gluconeogenesis
- lactate

Literature used

- VODRÁŽKA, Zdeněk. *Biochemistry*. 2nd edition. 2002. ISBN 978-80-200-0600-4. (in Czech).
- MATOUŠ, Bohuslav, et al. *Basics of medical chemistry and biochemistry*. 1st edition. Praha : Galén, 2010. 540 s. ISBN 978-80-7262-702-8.
- KOOLMAN, Jan and Klaus-Heinrich RÖHM. *Color atlas of biochemistry*. 1st edition. Praha : Grada, 2012. 512 s. ISBN 978-80-247-2977-0.
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