

Course Title: **Biochemistry II** Rad 2nd semester

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Steps involve in uric acid formation?

Ans:

Uric acid

Description

Uric acid is a heterocyclic compound of carbon, nitrogen, oxygen, and hydrogen with the formula $C_5H_4N_4O_3$.

It forms ions and salts known as urates and acid urates, such as ammonium acid urate.

Uric acid is a product of the metabolic breakdown of purine nucleotides, and it is a normal component of urine.

Formula: $C_5H_4N_4O_3$

IUPAC ID: 7,9-Dihydro-1H-purine-2,6,8(3H)-trione

Molar mass: 168.1103 g/mol

Soluble in: Water

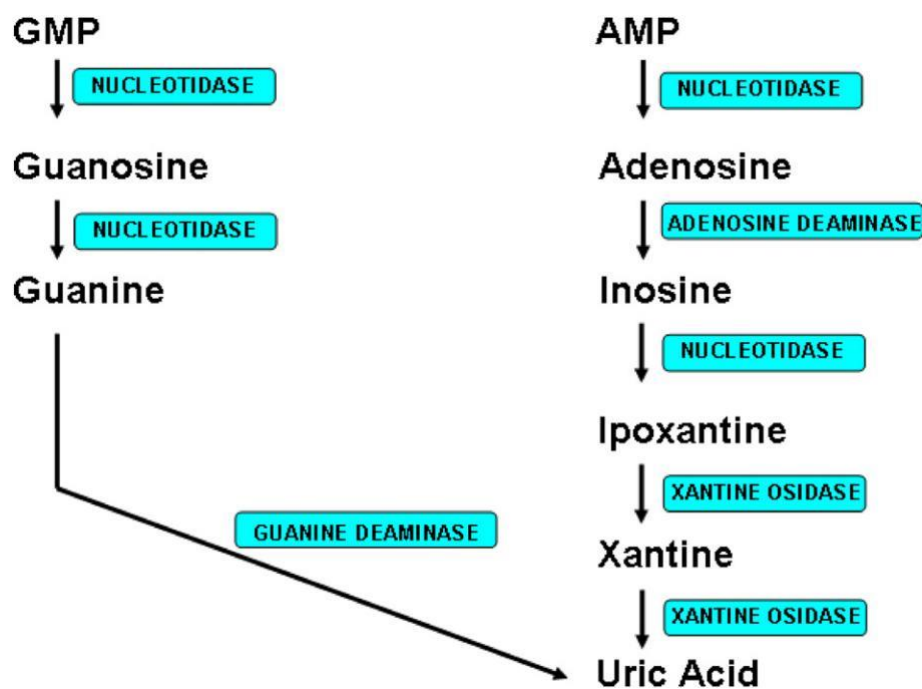
Basicity (pK_b): 8.4

Beilstein Reference: 156158

Heat capacity (C): $166.15 \text{ J K}^{-1} \text{ mol}^{-1}$ (at $24.0 \text{ }^\circ\text{C}$)

- *Uric acid production and metabolism are complex processes involving various factors that regulate hepatic production, as well as renal and gut excretion of this compound.*
 - *Uric acid is the end product of an exogenous pool of purines and endogenous purine metabolism.*
 - *The exogenous pool varies significantly with diet, and animal proteins contribute significantly to this purine pool.*
 - *The endogenous production of uric acid is mainly from the liver, intestines and other tissues like muscles, kidneys and the vascular endothelium.*
 - *Uric acid is a $\text{C}_5\text{H}_4\text{N}_4\text{O}_3$ (7,9-dihydro-1H-purine-2,6,8(3H)-trione) heterocyclic organic compound with a molecular weight of 168 Da.*
 - *Many enzymes are involved in the conversion of the two purine nucleic acids, adenine and guanine, to uric acid.*
 - *Initially, adenosine monophosphate (AMP) is converted to inosine via two different mechanisms; either first removing an amino group by deaminase to form inosine monophosphate (IMP) followed by dephosphorylation with nucleotidase to form inosine, or by first removing a phosphate group by nucleotidase to form adenosine followed by deamination to form inosine.*
 - *Guanine monophosphate (GMP) is converted to guanosine by nucleotidase.*
 - *The nucleosides, inosine and guanosine, are further converted to purine base hypoxanthine and guanine, respectively, by purine nucleoside phosphorylase (PNP).*
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- *Purines perform many important functions in the cell, being the formation of the monomeric precursors of nucleic acids DNA and RNA the most relevant one.*
 - *Purines which also contribute to modulate energy metabolism and signal transduction, are structural components of some coenzymes and have been shown to play important roles in the physiology of platelets, muscles and neurotransmission.*
 - *All cells require a balanced quantity of purines for growth, proliferation and survival.*

- Under physiological conditions the enzymes involved in the purine metabolism maintain in the cell a balanced ratio between their synthesis and degradation.
- In humans the final compound of purines catabolism is uric acid.
- All other mammals possess the enzyme uricase that converts uric acid to allantoin that is easily eliminated through urine.
- Overproduction of uric acid, generated from the metabolism of purines, has been proven to play emerging roles in human disease.
- In fact the increase of serum uric acid is inversely associated with disease severity and especially with cardiovascular disease states.
- This review describes the enzymatic pathways involved in the degradation of purines, getting into their structure and biochemistry until the uric acid formation.



NORMAL RANGE

- At physiologic pH, uric acid is a weak acid with a pKa of 5.8. Uric acid exists majorly as urate, the salt of uric acid.
- As urate concentration increases in blood, uric acid crystal formation increases.
- The normal reference interval of uric acid in human blood is 1.5 to 6.0 mg/dL in women and 2.5 to 7.0 mg/dL in men.

- *The solubility of uric acid in water is low, and in humans, the average concentration of uric acid in blood is close to the solubility limit (6.8 mg/dL).*
- *When the level of uric acid is higher than 6.8 mg/dL, crystals of uric acid form as monosodium urate (MSU).*
- *Humans cannot oxidize uric acid to the more soluble compound allantoin due to the lack of uricase enzyme.*
- *Normally, most daily uric acid disposal occurs via the kidneys*

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The End
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