The Effect of Caffeine on the human body

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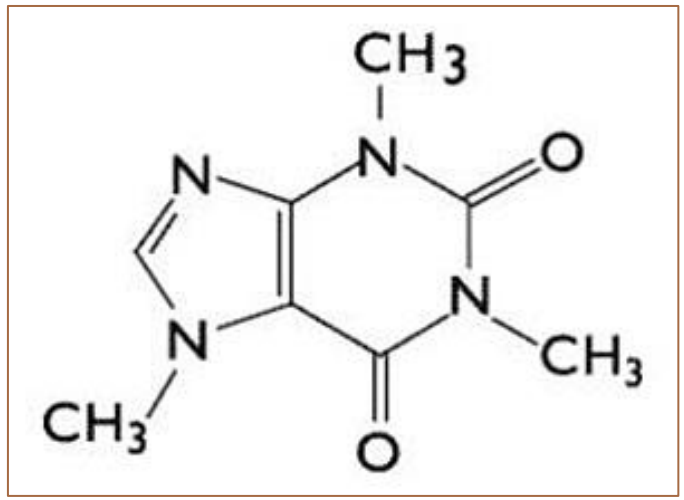
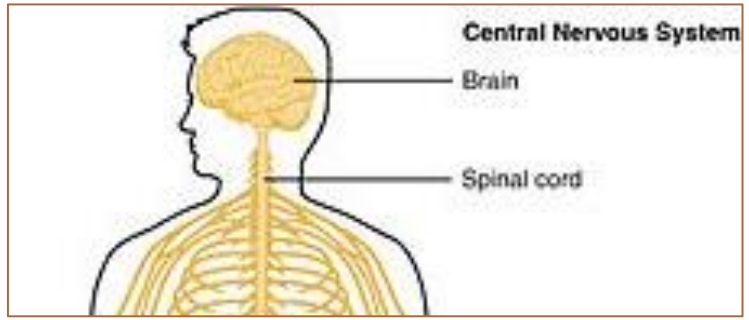
* Tolerance : 내성 * Heredity : 유전

The Structure of Caffeine



Source: LG science land



Source: Wikipedia

- $C_8H_{10}O_2N_2$

- A kind of Alkaloid

  ex) Cocaine, Nicotine, Caffeine

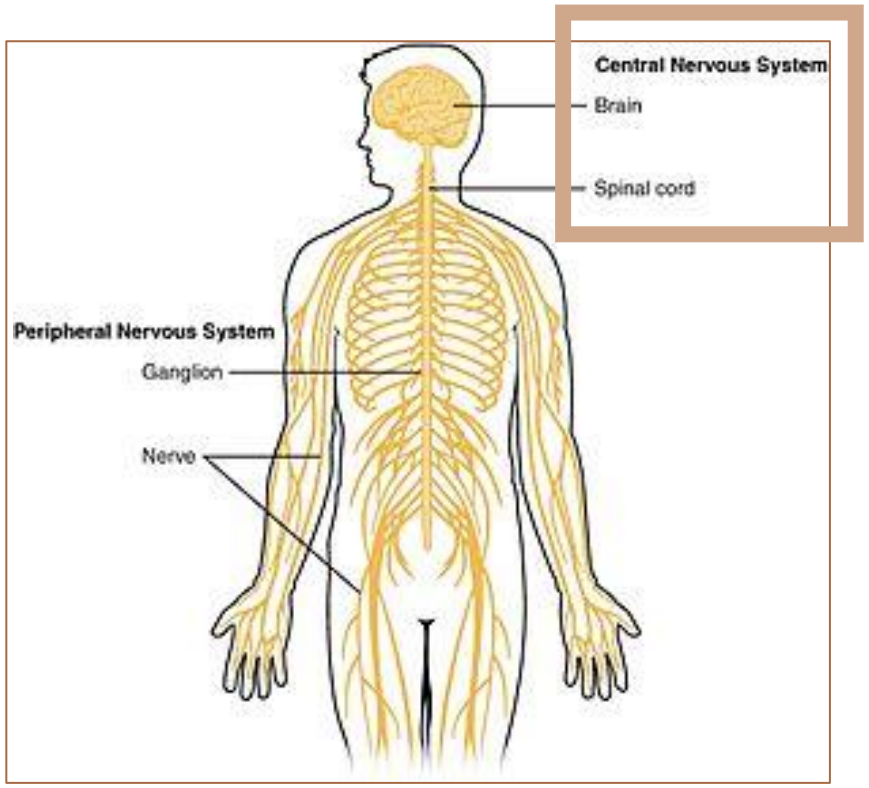
- It is CNS stimulant (Central Nervous System stimulant)

-Symptom like blood pressure rising, Diuresis

- Basic
- Naturally exist in Organic compound that contain at least one nitrogen atom
- Acts on a diversity of metabolism system

* Diuresis : 이뇨작용 *Stimulant : 각성제

The Structure of Caffeine



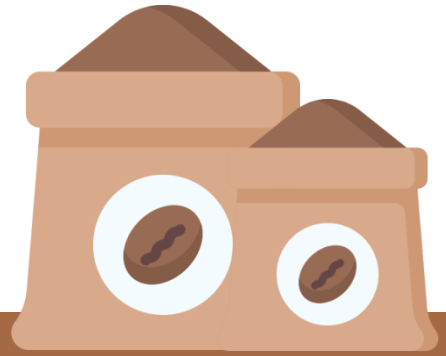
Source: Wikipedia

< Central Nervous System >

- Integrate information and Influence the activity of body
- Major of the nervous system

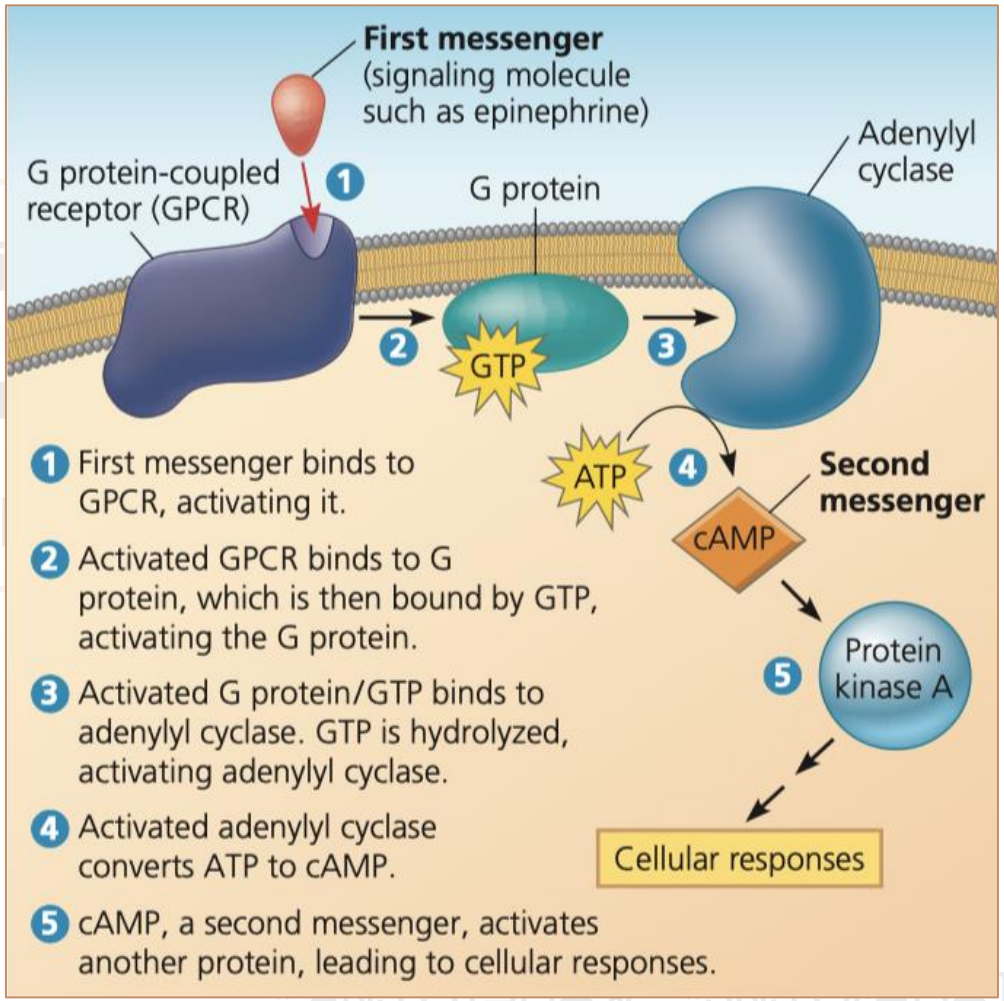
< CNS stimulant >

- Increase the levels of certain chemicals in the brain
- Increases attention, energy, …
- Symptom like blood pressure rising, Diuresis

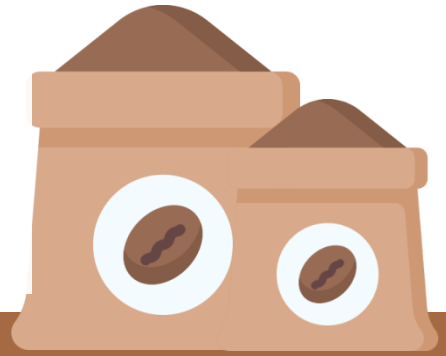


* Diuresis : 이뇨작용 *Stimulant : 각성제

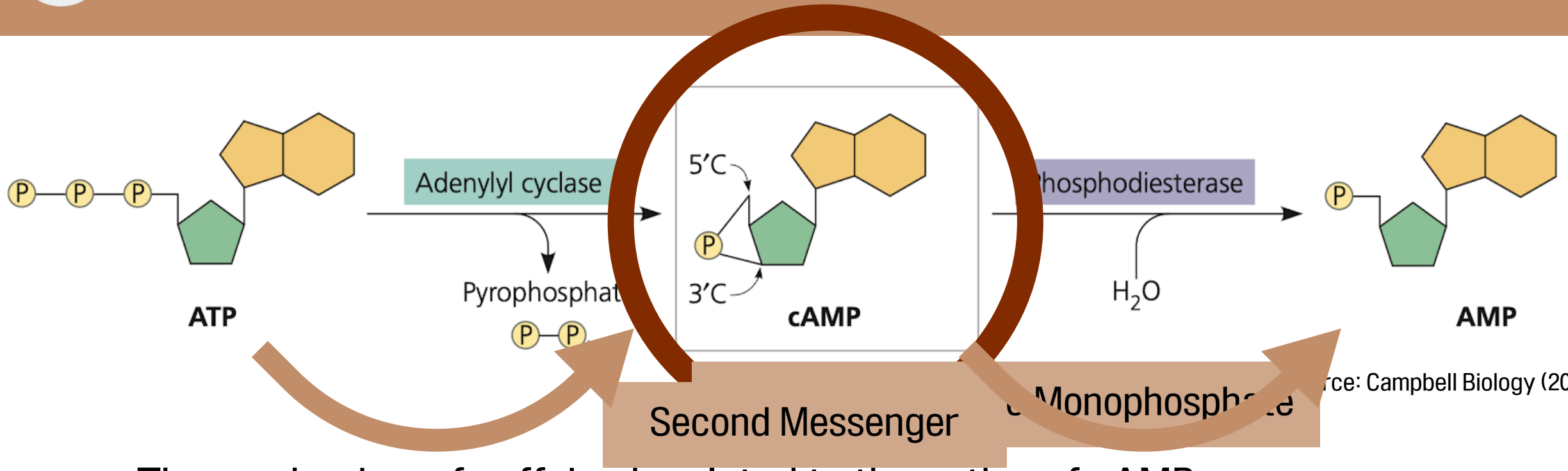
The Structure of Caffeine



As a result,
It strain our body



The Mechanism of Caffeine



-The mechanism of caffeine is related to the action of cAMP

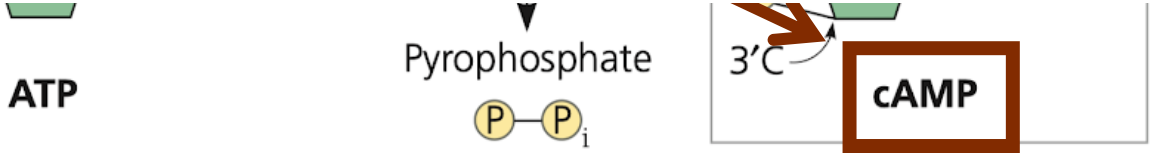
* Adenylyl cyclase : 아데닐산고리화효소 *Phosphodiesterase : 인산이에스테르가수분해효소

The Mechanism of Caffeine

Q. How does cAMP affect cell reaction?

1. Epinephrine sticks to liver cell membrane.

If cAMP remains in the cell,
It has the same effect on the cell as Epinephrine.



2. It activate the Adenylyl Cyclase.

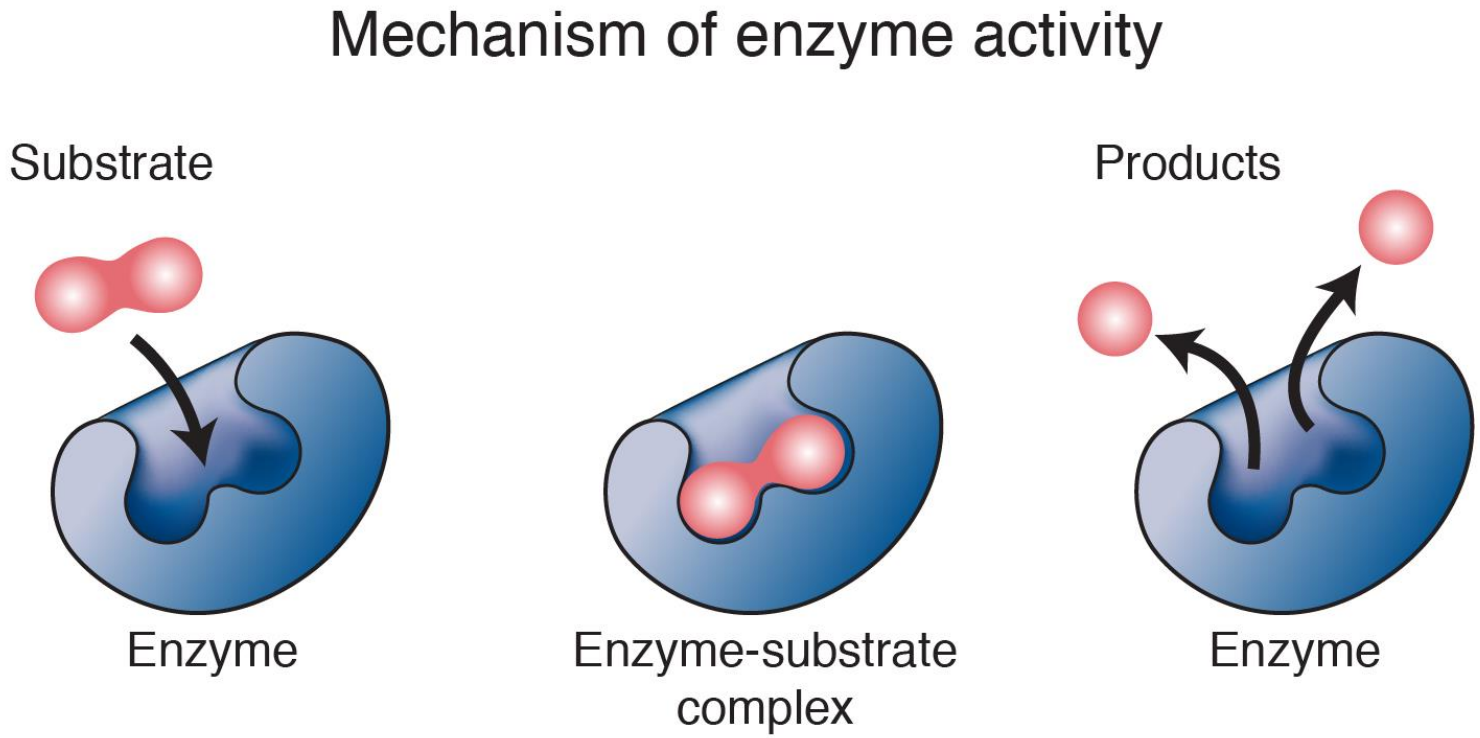
3. It makes cAMP.

4. It affects the cells.

Source: Campbell Biology (2016)

The Mechanism of Caffeine

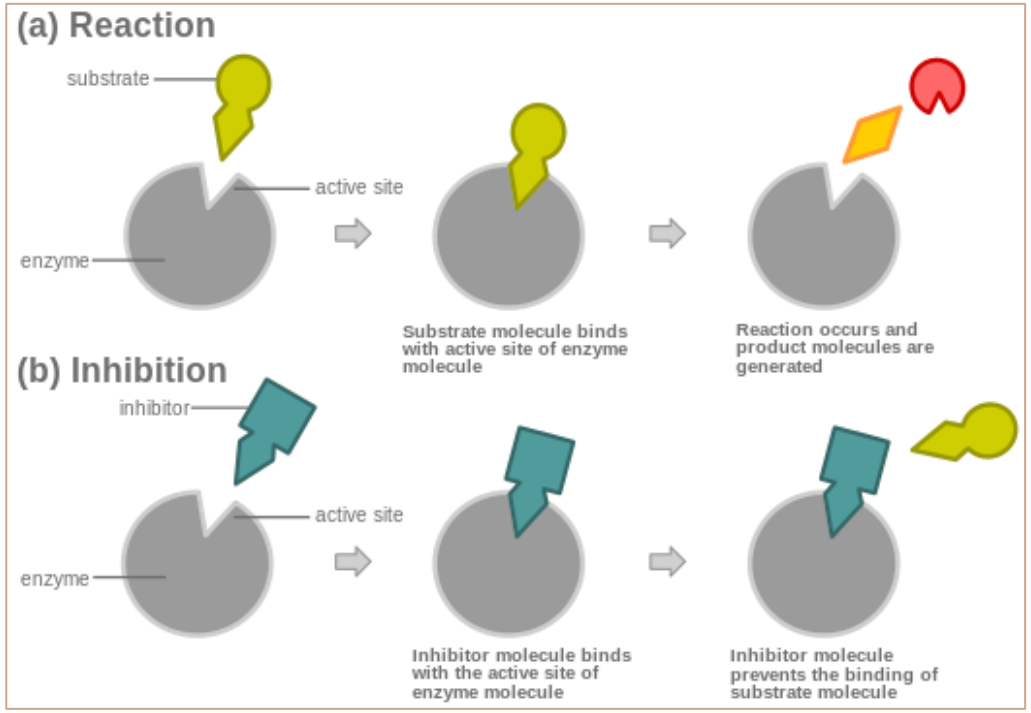
< Action of Enzyme >



Source: https://www.genome.gov/genetics-glossary/Enzyme

The Mechanism of Caffeine

< Competitive Inhibitor>



Source: Wikipedia

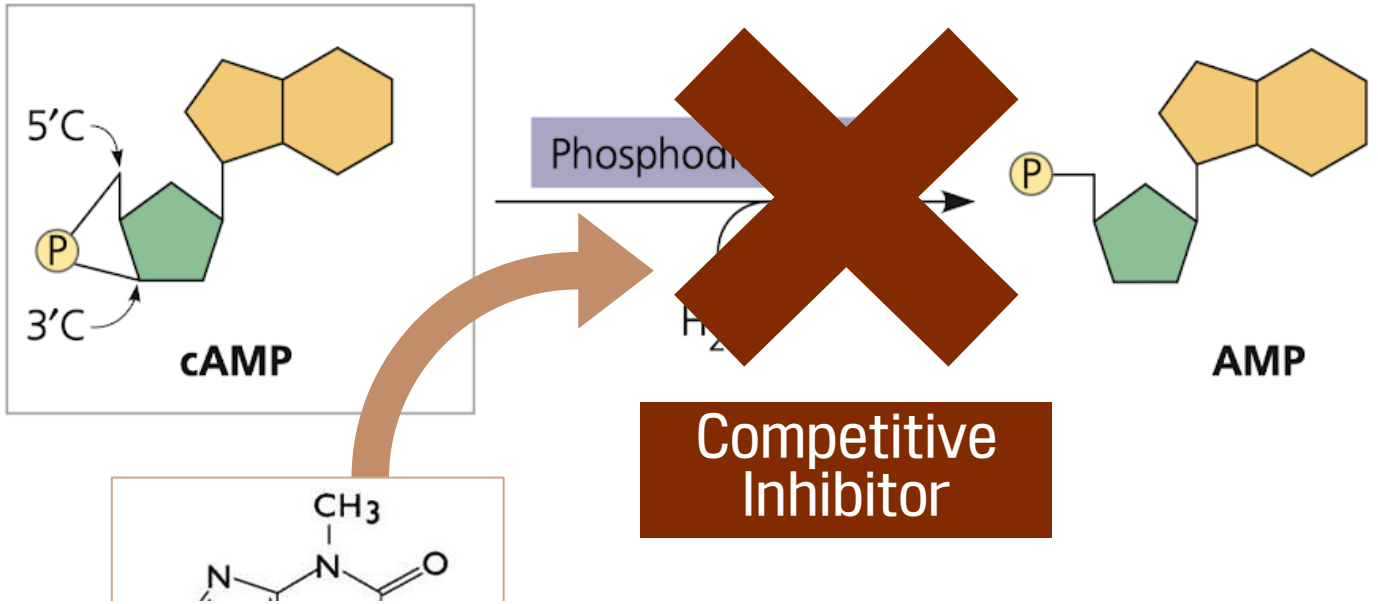
- One kind of enzyme inhibitor
  - -Competitive inhibitor
  - -Noncompetitive inhibitor
  - -Uncompetitive inhibitor

-They compete for the active site.

-The Competitive Inhibitor and the substrate have similar structure

The Mechanism of Caffeine

‹ Caffeine as Competitive Inhibitor ›



The effect of Epinephrine continues.

So we DO NOT feel tired.

The Tolerance and Heredity of Caffeine

Heredity of **CYP1A2** protein

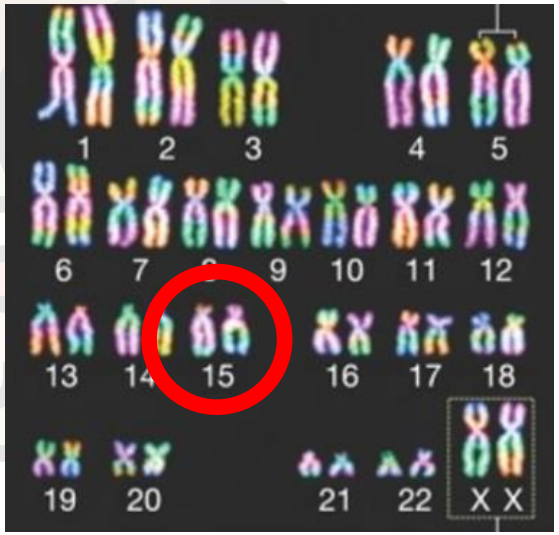
- one of the drug metabolizing enzymes

- It also decompose the caffeine

-The **Activity** of the enzymes is determined by the gene on the chromosome 15

-Highly active enzymes break down caffeine quickly

Source: Korea Gene Association



Source: http://may2017.archive.ensembl.org/Homo_sapiens/Gene/Summary?db=core;g=ENSG00000140505;r=15:74748844-74756202;t=ENST00000343932

The Tolerance and Heredity of Caffeine

< Caffeine Recipe >

- Getting from Coffee beans is the most efficient way.
- We can also get caffeine by chemical synthesis.

< Side effects >

- Insomnia, anxiety, nausea
- How can we decompose caffeine quickly?

* Insomnia : 불면증 *Anxiety : 불안증세 *Nausea : 메스꺼움

Q & A