(Ethanol metabolism)

prof.dr. zuhair maarouf hussein
biochemistry

- Ethanol is oxidized in the liver by cytosolic alcohol dehydrogenase to form acetaldehyde :

$CH_3CH_2OH + NAD = CH_3CHO + NADH + H$

-Acetaldehyde is further oxidized to acetate by a mitochondrial aldehyde dehydrogenase :

$CH_3CHO + NAD + H_2O = CH_3COO + NADH + H$

-Much of the acetate produced from ethanol leaves the liver and is converted to acetyl CoA which enter TCA cycle and convert into ATP , CO_2 and H_2O .

- Acetyl CoA may also be formed in the liver and used as a precursor for lipid biosynthesis .

- The increased NADH / NAD^+ ratio causes a shift to left in the equillibrium :

(malate = oxaloacetate)

which may reduce activity of the CAC .

- The increased NADH/NAD^+ ratio also causes increased lactate / pyruvate resulting in hyperlacticacidemia which decreases excretion of uric acid, aggravating gout .

-Other effect may inlcude increased cholesterol synthesis from acetyl CoA .

- The net effect of inhibiting FA oxidation by ethanol is to causes increased esterfication of fatty acid in triacylglycerol which appears to be the cause of the fatty liver .

- Ethanol also inhibit the metabolism of some drug (i.e : barbiturates) and prolong the time remain effective in the body . (Hydroxylation of barbitual in liver cell is inhibited by ethanol) .

Notes :

1-Disulfiram is a drug use in treatment of ethanol , it inhibited aldehyde dehydrogenase by competing with NAD for binding site of the enzyme , so increase the level of acetaldehyde in the blood causing symptoms of vomiting ,thirst , sweat and head achalasia .

Q : The person who drink alcohol become fat ? Why

This because acetyl CoA convert to fat and accumulate in the body .

2 . Women have less alcohol dehydrogenase in their stomach than men , meaning that they do not metabolize alcohol quickly .

Additionally , older males and people suffering from liver damage , also have less alcohol dehydrogenase in their stomachs .

3 . Adult hemoglobin (Hb A) consists of four polypeptide chains (two alpha and two beta chains) , each containing a molecule of heme . Each molecule of hemoglobin contain four molecules of heme while myoglobin contain one molecule of heme .

4 . In sickle cell anemia the B-chain of hemoglobin contain a valine instead of glutamate at position 6 . RBCs that contain large complexes of (Hb S) molecules can assume a sickle shape .These cells undergo hemolysis and an anemia result .

5 . Proteins can be denaturated by agents such as heat and urea that causing unfolding of polypeptide chains without causing hydrolysis of peptide chains . If a denaturated proteins returns to its native state after the denaturing agent is removed , the process is called renaturation .