

Biochemistry Justification

General

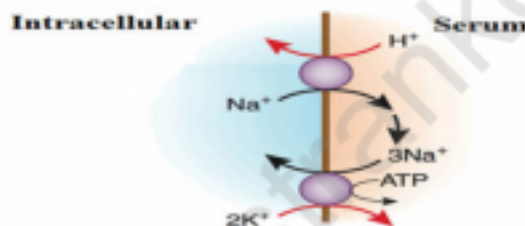
1. Why ORS contain glucose and NaCl?

- Oral rehydration solution is used in treatment of dehydration in case of diarrhea.
- ORS contain
 - a. Sodium chloride
 - b. Sodium citrate
 - c. Glucose
- There is lots of amount of water as well as sodium loss in case of diarrhea.
- So, to correct dehydration, water is there with ORS.
- As Glucose and Sodium get absorbed by symport (co-transport) mechanism, there is always, glucose is needed for sodium absorption.

2. Hyperkalemia can occur in Metabolic acidosis.

- There is increase concentration of H^+ in Metabolic acidosis
- More potassium ions moves from intracellular to extracellular (into serum), due to high H^+ concentration,

H^+/K^+ exchange



3. Blood Buffers act quickly but not permanently.

- There are three buffering mechanisms for acid-base balance.
 - a. Blood buffer
 - b. Respiratory mechanism
 - c. Renal Mechanism
- In blood buffer, Bicarbonate buffer ($H_2CO_3/NaHCO_3$) is in a ratio of 1:20
- Hence, it has the highest capacity to neutralize H^+ ions.
- As well as, it immediately balances acid and base.
- CO_2 excretion through the Respiratory mechanism and H^+ excretion through the Renal mechanism require some time.
- So Respiratory and renal mechanism are delayed mechanisms but excrete acid permanently from blood.
- Means, Blood Buffers act quickly but not permanently.

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*Biochemistry Justification***Carbohydrate****4. Glycerol is used in enema.**

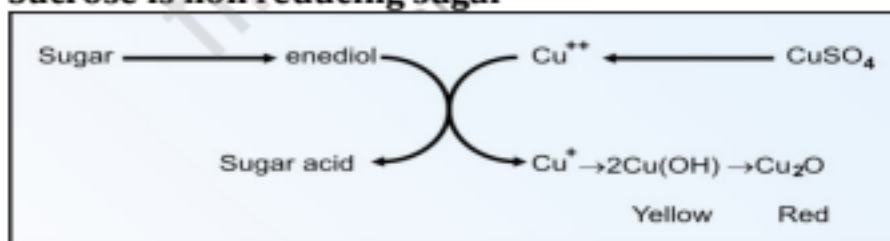
- Glycerol is alcohol of glyceraldehyde.
- It has same properties like carbohydrate.
- It is also very highly osmotically active substance.
- So when it given orally or per rectally, it pull water into lumen of the intestine from intravascular & intracellular space.
- That increase water content of stool and make easy defecation.
- So Glycerol is used in enema.

5. Acarbose is used in treatment of diabetes mellitus?

- Acarbose is structurally analogues to starch.
- So it inhibit action of amylase.
- So Decrease breakdown & digestion of carbohydrate.
- So Less amount of glucose get release and less get absorb from intestine.
- Which help to keep glucose level low.
- So Acarbose is used in treatment of diabetes mellitus.

6. Structure of proteoglycan is well suited for its function.

- Proteoglycans are made up of uronic acid and amine sugar with sulfate.
- Because of amine group and sulfate, they became charge molecule.
- Because of that charge, it can attract more amount of water.
- So it can keep medium spongy as well as like jelly.
- So it can absorb shocks and can work as lubricant.

7. Sucrose is non reducing sugar

- Sucrose is made of Glucose and Fructose with alpha 1-2 glycosidic linkage.
- Aldose, function group of Glucose is at 1st carbon.
- Keto, function group of fructose is at 2nd carbon.
- But function groups are involve in alpha 1-2 glycosidic.
- So no function is free to form enediol.
- No reduction of copper sulfate
- Negative benedict test.
- So "Sucrose is called non reducing sugar."

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8. Sucrose is invert sugar

- Sucrose (+ 66.5°) = Glucose (+52.5°) + Fructose (- 92°)
- Sucrose is Dextro rotatory
- While sucrose get hydrolysis, fructose give more levo-rotation than glucose dextro rotation.
- So after hydrolysis of sucrose became levorotatory.
- So there is change in rotation from dextro to levo.
- So sucrose is called invert sugar.

9. Dextran is use as plasma volume expander

- It is a complex branched polysaccharide of glucose of varying lengths, with high molecular weight.
- Because of complex structure, it can not be broken down.
- But it can give its osmotic properties in intravascular space.
- Pull more water into intravascular space and keep it there for longer time.
- It increases blood volume and reducing its viscosity
- thus it used as plasma expander.

10. In acute myocardial infarction, there is elevation of lactic acid in cardiac myocyte.

- Myocardial infarction is complete occlusion of coronary artery due to thrombosis formation.
- That decreases blood supply as well as oxygen supply to myocardium.
- In absence of oxygen, these myocardium does anaerobic glycolysis for energy purpose.
- There anaerobic glycolysis convert all pyruvate to lactic acid.

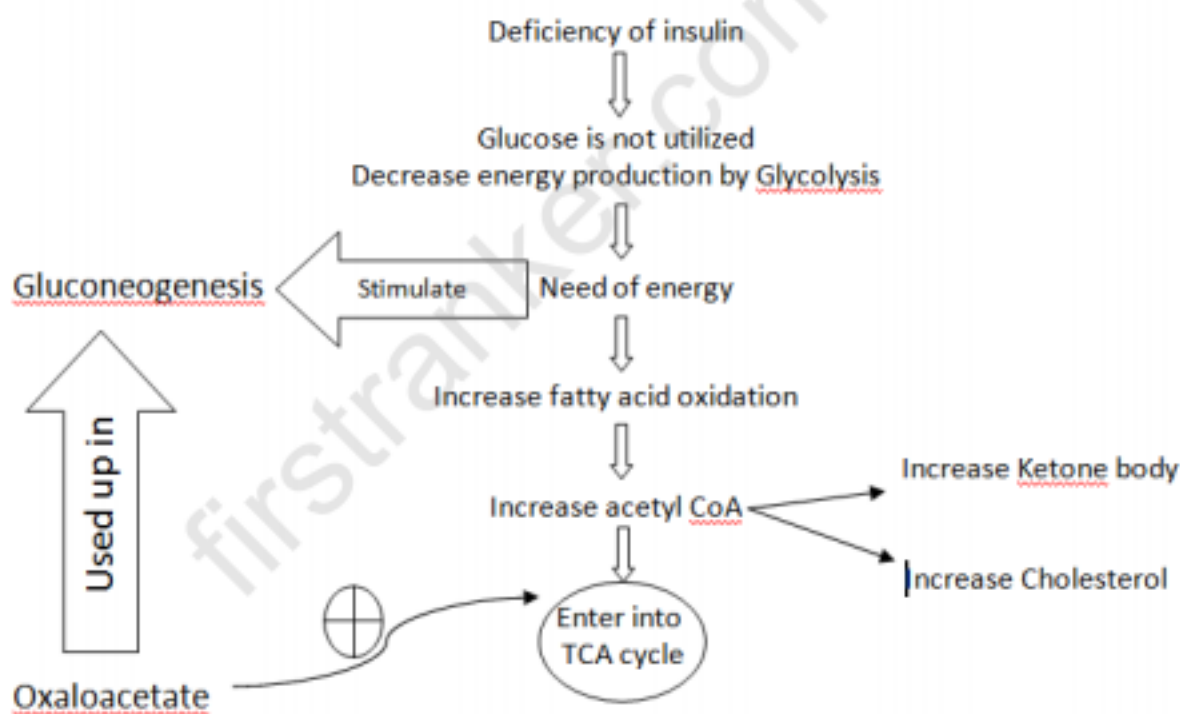
11. Human can not digest cellulose.

- Cellulose has beta 1-4 glycosidic linkage (cellobiose bridge)
- Human Amylase can break only
 - alpha 1-4 glycosidic linkage.
 - alpha 1-6 glycosidic linkage.
- Human has deficiency of enzyme for beta 1-4 linkage. (Cellulobiase)
- Therefore humans can not digest cellulose

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*Biochemistry Justification***12. Fluoride containing vial is use for collecting blood for blood sugar estimation.**

- Collected blood sample has RBC, WBC, Platelet cells etc, which can use glucose of same sample.
- So during transportation and processing time, when sample get delay in analysis, glucose may get reduced.
- And gives false low result of blood glucose.
- In presence of fluoride, Enolase enzyme of glycolysis inhibited. So cell can not use glucose.
- That gives correct value for blood glucose
- So Fluoride containing vial is use for collecting blood for blood sugar estimation.

13. Patient of IDDM have more risk of diabetic ketocidosis than NIDDM.

- In type II diabetes mellitus, there is increase in insulin level.
- Because of increase insulin level,
- Due to decrease sensitivity of receptors, glucose is not utilized.
 - Prevent Proteolysis
 - Prevent Fatty acid oxidation.
 - Less Acetyl CoA formation
 - Less ketone body formation
- Less Chances of Diabetic Ketoacidosis

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14. Uncontrolled diabetes mellitus leads to neuropathy & retinopathy.

Polyol pathway

- Hyperglycemia causes increased levels of intracellular glucose in nerves.
- Extra glucose is shunted into the polyol pathway and converted to sorbitol and fructose by the enzymes aldose reductase and sorbitol dehydrogenase.
- Accumulation of sorbitol and fructose lead to reduced nerve myoinositol and structural breakdown of nerves
- It causing abnormal conduction.

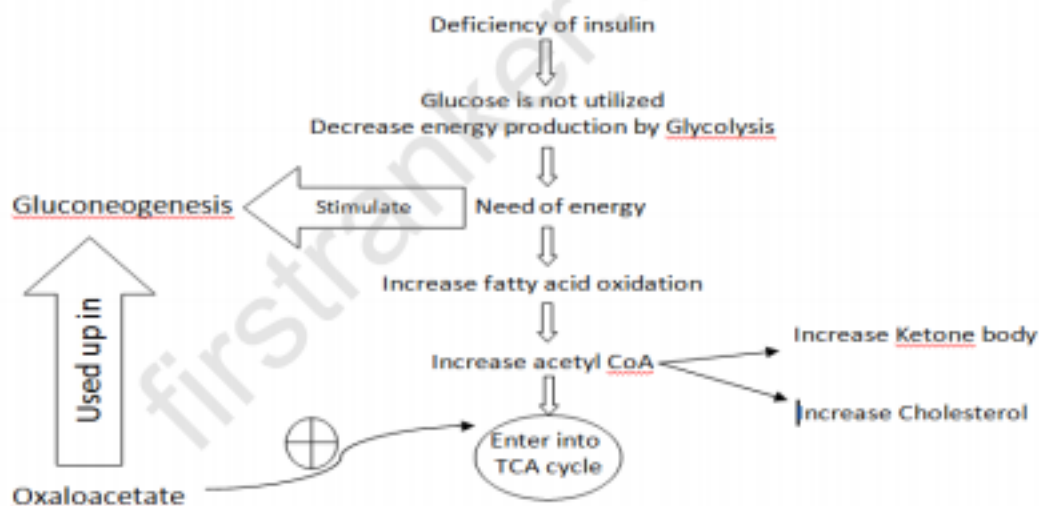
Advanced glycation end products

- Excess glucose makes non-enzymatic reaction with proteins, nucleotides and lipids. Which is called "Advanced Glycation End products (AGEs)".
- It may have disrupt neuronal integrity and nerve conduction.

Oxidative stress

- Increased production of free radicals in diabetes
- These include direct damage to blood vessels leading to nerve ischemia.

15. Explain Why Diabetic patients are more prone to Atherosclerotic disease.

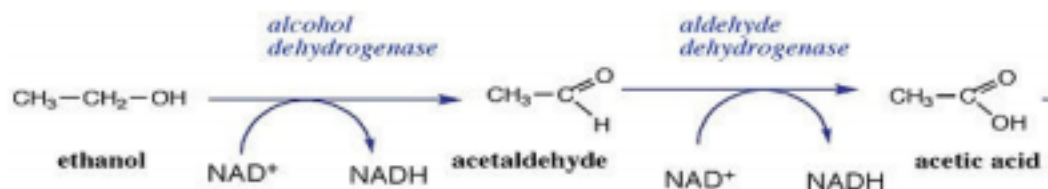


- In Uncontrolled diabetes mellitus, there is increase in insulin level.
- But glucose can not utilized by Cell, So there is
 - More Proteolysis & More Fatty acid oxidation for energy production.
- Because of more fatty acid oxidation for energy purpose, there will be more Acetyl CoA formation.
- And simultaneously, due to stimulation of gluconeogenesis process and oxaloacetate deficiency, that excess acetyl CoA can not enter into TCA cycle.
- That excess acetyl CoA make synthesis of
 - More cholesterol formation
 - More ketone body formation
- Hence, Uncontrol Diabetes mellitus, there is more chances of atherosclerosis.

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16. "Alcohol inhibit gluconeogenesis,so it causes hypoglycemia,if person is on starvation." explain it.



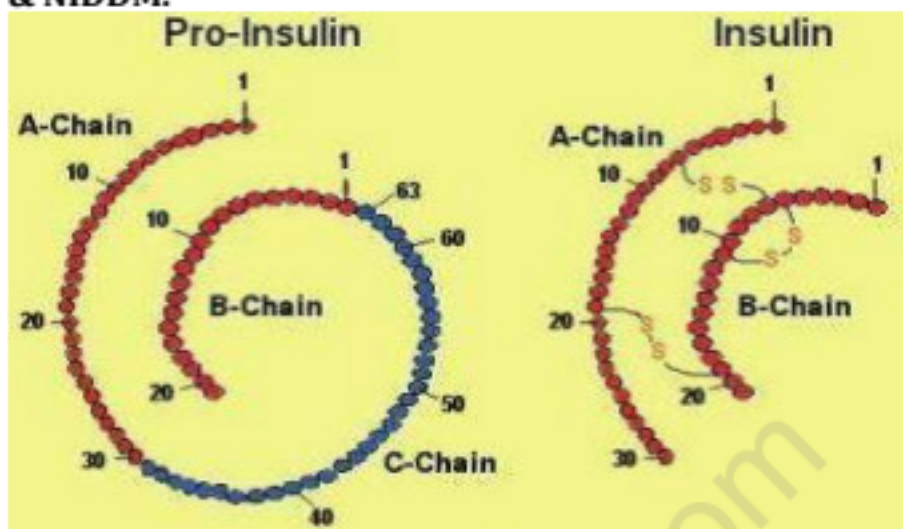
- Ethanol and Methanol both increase NADH:NAD ratio.
 - The high concentration of NADH
 - Convert all pyruvate to lactate.
 - Inhibit TCA cycle
 - Decrease production of Oxaloacetate
 - So, process of gluconeogenesis become slow and inhibited.
17. Primaquine administration in G6PD deficient patient can precipitate Hemolytic anaemia.
- Decreased activity of G6PD impairs Hexose Monophosphate (HMP) Shunt.
 - Thus there is no synthesis of NADPH in RBC.
 - Primaquine induce free radical (oxidative stress) in RBC.
 - To overcome this oxidative stress, NADPH is required which is deficient in G6PD patients.
 - That high amount of free radical make damage RBC membrane
 - And induce hemolytic anaemia.
18. Cataract is more common in diabetes mellitus.
- Due to high amount of glucose
 - Increase glycation of crystalline protein of lens
 - Makes denaturation of crystalline protein of lens
 - Lens became opaque.
 - In lens, kidney and nerve cell, there is deficiency of Sorbitol dehydrogenase deficiency.
 - High glucose produce high sorbitol, that sorbitol can not diffuse out of lens.
 - High sorbitol pull more water into lens and make lens swelling & opacity.



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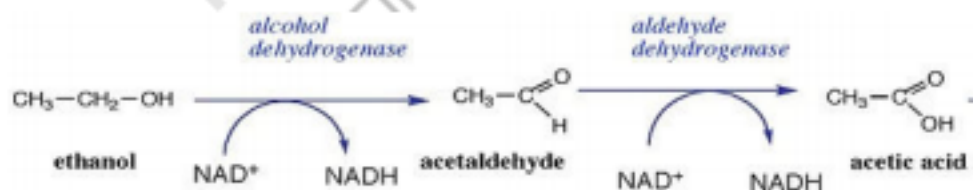
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19. Estimation of C-Peptide is better parameter to differentiate IDDM & NIDDM.



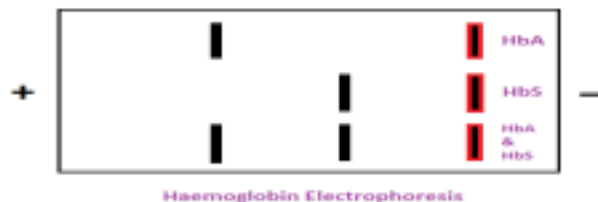
- Endogenous insulin synthesis in pre-pro-insulin form.
- Pre-pro-insulin is converted to the active insulin, simultaneously each molecular of pre-pro-insulin release connecting peptide (c-peptide).
- Endogenous Insulin & c-peptide are produced in equimolar concentration.
- So, C-Peptide level in plasma indicate endogenous production of insulin.
- IDDM= No endogenous production of insulin.
- NIDDM= Normal or Increased endogenous production insulin.
- Plasma insulin level get alter by exogenous insulin administration.
- Thus ,Very low C-peptide confirms type 1 diabetes(IDDM) & normal or high C-peptide confirms type 2 diabetes(NIDDM).
- So, C-peptide is used to differentiate IDDM &NIDDM.

20. Chronic alcoholism cause gouty arthritis.



- Ethanol and Methanol both increase $\text{NADH}:\text{NAD}$ ratio.
- The high concentration of NADH convert all pyruvate to lactate (lactic acid).
- This lactic acid compete with excretion for uric acid in renal tubule and decrease excretion of uric acid.
- That increase uric acid level and converted to uric acid crystal due acidic pH because of lactic acid.
- Hence, Chronic alcoholism cause gouty arthritis.

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*Biochemistry Justification***Protein & Amino acid****21. HbS move slower than HbA in alkaline gel electrophoresis.**

- Gel electrophoresis is a diagnostics test in sickle cell anemia.
- In sickle cell disease, there is replacement of glutamic acid by valine.
- Negative charged Glutamic acid is replaced by neutral charged valine
- So HbS has less negative charge than HbA.
- Less negative charged molecule moves less in electrophoresis.
- During electrophoresis, in alkaline medium (pH 8.6), sickle cell hemoglobin moves slowly towards anode (positive electrode) than does adult HbA.

22. 2,3 BPG decrease affinity of oxygen for hemoglobin.

- When 2,3-BPG binds to deoxyhemoglobin, it acts to stabilize hemoglobin in "T state".
- It fits neatly into the cavity of the deoxy- conformation and its positive polarity by forming salt bridges with lysine and histidine residues in the β subunits of hemoglobin.
- It makes difficult for oxygen to bind hemoglobin and more likely to be released to adjacent tissues.
- 2,3-BPG is part of a feedback mechanism to prevent tissue hypoxia, in conditions where there is a chance of tissue hypoxia.

23. Lead inhibits heme synthesis.

- Lead inhibits zinc-containing enzyme ALA dehydratase and ferrochelatase of heme synthesis.
- So, it inhibits heme synthesis.
- Means, Lead exposure can cause chronic anemia.

24. Photosensitivity does not occur in acute intermittent porphyria.

- In acute intermittent porphyria, there is a deficiency of uroporphobilinogen synthase - I (porphobilinogen-deaminase) of heme synthesis.
- This enzyme converts porphobilinogen to hydroxymethylbilane.
- In AIP, the porphyrin precursors, porphobilinogen and amino-levulinic acid (ALA), accumulate.
- The predominantly neurologic damage like peripheral and autonomic neuropathies and psychiatric manifestations occurs.

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25. Blue fluorescent light is useful in treatment of neonatal jaundice.

- Blue fluorescent light penetrate the skin and that light is absorb by billirubin.
- Due to light absorption , Bilirubin is converted into two isomers.
 - Z-Bilirubin (Lumirubin , Structural isomer, Irreversible)
 - E-Bilirubin (Photobilirubin , configurational isomer, reversible)
- Both are less lipophilic than normal billirubin , without involvement of liver conjugation.
- This billirubin is excreated though bile and urine.

26. Zwitter ions has minimum buffering & solubility capacity.

- Zwitter ion form of amino acid has net charge zero.
- It contain equal number of positive & negative charges.
- Due to that increase attraction between the each molecule and increase chances of precipitation formation.
- So it is less soluble.
- Due to zero net charge, it can neutralized less acid and base.
- So , it is less buffering capacity.

27. Row egg is use in treatment of metal poisoning.

- In case of Metal poisoning , Metal causes denaturation of protein of the gastro-intestinal cells.
- Damage mucosa and get absorb.
- If raw egg protein precipitated by metal.
- Decrease damage to gastro-intestinal mucosa as well as it absorption.
- Decrease toxicity of Metal poisoning.
- So Raw egg is used in metal poisoning.

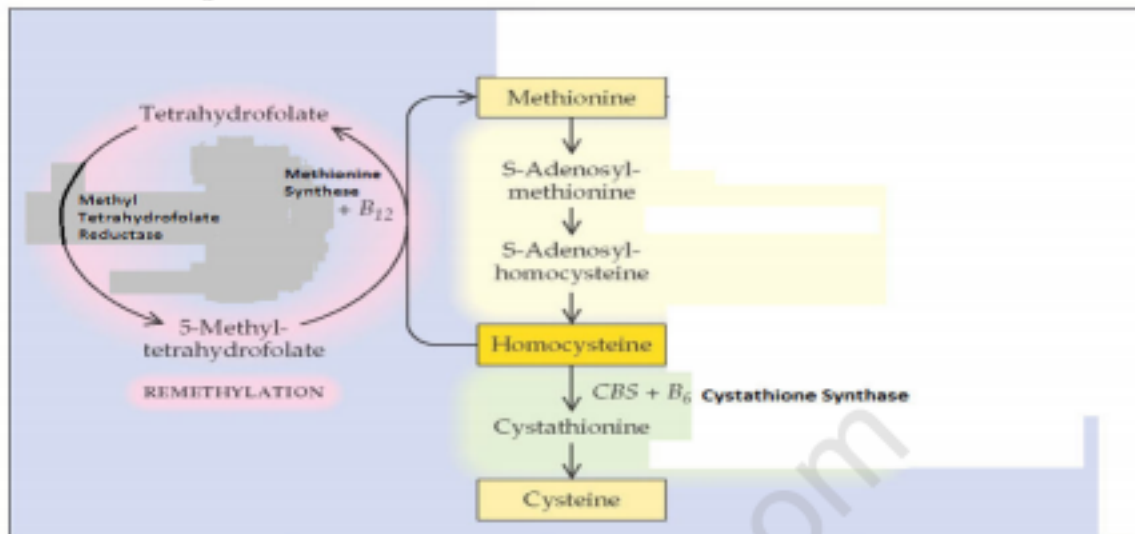
28. Increase level of Homocysteine increase risk of atherosclerosis

- Interfere with lysyl residual of collagen tissue.
 - Collagen cross linking is affected.
 - Collagen tissue of blood vessels are damage easily
- Homocysteine thioleone is a highly reactive free radical
 - which thiolate LDL
 - Increase oxidized LDL
 - Increase tendency for atherosclerosis.
- It activate Hageman's factor
 - More chance of platelet aggregation.
- This action of homocystein increase risk of atherosclerosis..

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29. Folic acid, vitamin B12 and pyridoxime phosphate is use to reduce homocysteine level.



- Hyperhomocysteinemia leads to vascular disease
- Vitamin B12 & Folic acid is require as co-enzyme for action of Methionine synthesis & Methyl Tetrahyofolate Reductase enzyme.
- And convert homocysteine to methionine.
- Pyridoxime phophate (Vit-B6) is require for cystathione synthase activity.
- Which convert homocysteine into cystein.
- So Folic acid, vitamin B12 and pyridoxime phosphate is use to reduce homocysteine level

30. "Haemoglobin is good blood buffer".

- Haemoglobin is present in highest concentration in blood.
- And it contain maximum amount of imidazole group containing histidine (38 residual) amino acid.
- Histidine's pK (6.8) value is very nearer to physiological pH, so it can bind more amount of H^+ ions.
- Deoxygenated haemoglobin can bind with H^+ due Haldane effect.
- Hence, "Haemoglobin is good blood buffer"

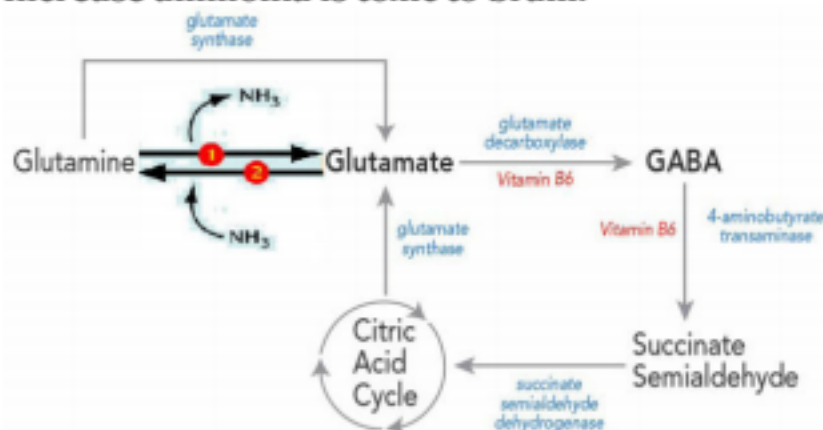
31. Alpha 1 anti-trypsin deficiency cause emphysema.

- Alpha 1 anti-trypsin inactivate elastase enzyme and prevent damage to elastic and collagen containing tissue like lung's alveoli.
- In it's deficiency, there is more activity of elastase enzyme.
- Lung's alveoli get damage due to over activity of elastase.
- And it causes emphysema.

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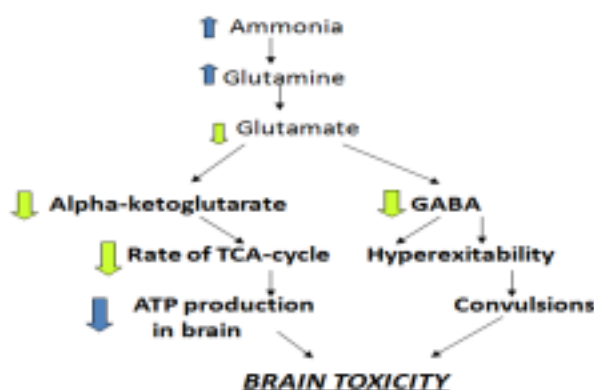
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32. Increase ammonia is toxic to brain.



Mechanisms for toxicity of high Ammonia

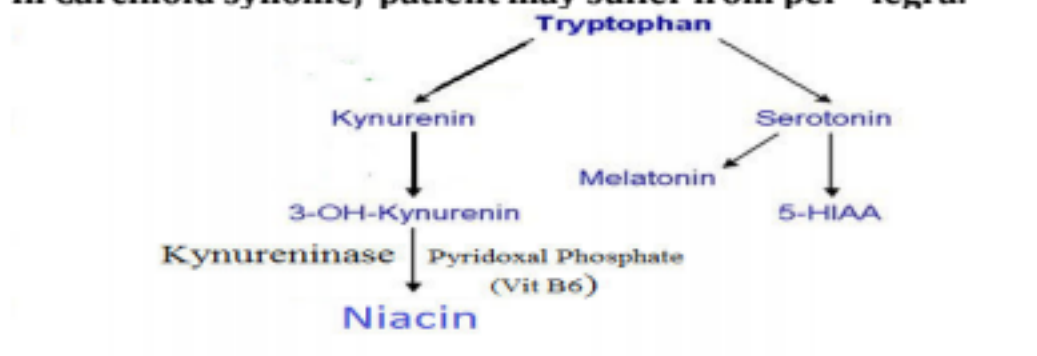
- High $[NH_3]$ would inhibit Glutamine Synthase:
 - Glutamate + $NH_3 \rightarrow$ Glutamine
 - This decreases glutamate.
 - So there is decreased synthesis of inhibitory neurotransmitter GABA. That makes convulsion.
- Depletion of glutamate & high ammonia level would drive Glutamate Dehydrogenase reaction to
 - α -ketoglutarate + $NH_4^+ \rightarrow$ Glutamate
 - These resulting depletion of α -ketoglutarate, an essential Krebs Cycle intermediate, could impair energy metabolism in the brain.
 - Which affects normal physiological brain activity.
- Due to high ammonia, conc. of Glutamine remains high in brain cell.
 - Glutamine is co-transported outside from brain cell with tryptophan influx.
 - So, more tryptophan gets accumulated in brain cell and more glutamine goes out of cell.
 - From accumulated tryptophan, serotonin synthesis & that has a depressive effect on neurons.



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33. In Carcinoid synome, patient may suffer from pellagra.



- Carcinoid synome is neuroendocrine tumors of the GI tract
- In normal person, only 1% of dietary tryptophan is converted to serotonin.
- But in carcinoid synome, almost 60% of tryptophan is used for serotonin synthesis.
- Which limits the available tryptophan for niacin synthesis.
- Which leads to decrease in conversion of tryptophan to niacin synthesis.
- Hence, deficiency of niacin leads to pellagra.

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Lipid

34. Pancreatitis leads to steatorrhea.

- To break ester bond of triglyceride, cholesterol ester and phospholipid of food lipid (fat), lipase enzyme from pancreas require.
- In pancreatitis (inflammation of pancreas), there is decrease secretion of lipase enzyme from pancreas
- Due to deficiency of lipase enzyme, Lipid digestion remain undigested.
- That lipid oplet get emulsified because of bile (splited) but it can not be digested due to lipase deficiency.
- So Patient of pancreatitis had a split steatorrhea

35. Cystic fibrosis causes deficiency of lipid soluble vitamin.

- Cystic fibrosis is genetic disease due to mutation in CFTR (Cystic Fibrosis Transmembrane Regulator) gene.
- Which affect all secretory glands.
- Due to this pancreatic , gall bladder & all most all glands secret thick and sticky secretion.
- That increase chance of blockage in gland.
- Decrease Bile & Pancreatic secretion.
- Decrease digestion & absorption of fat
- Decrease digestion & absorption of fat soluble vitamins.

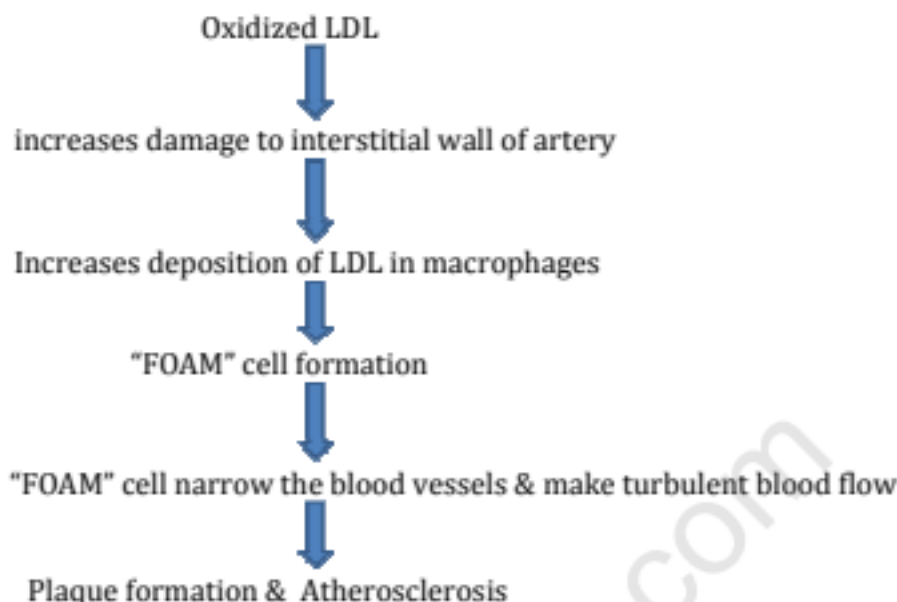
36. Orlistat (pancreatic and hepatic lipase inhibitor)treatment is supplemented with lipid soluble vitamins.

- Pancreatic lipases degrade dietary Triglyceride into Fatty acid & Glycerol.
- Orlistat = Non-hyolysable analog to Triglycerid e
- Power pancreatic lipase inhibitor
- So no breakdown of Triglyceride
- So no reabsorption of fat
- Ultimatly no reabsorption of fat soluable vitamin (A,D,E,K)

37. Sunflower oil (Omega-3 & Omega-6 fatty acid) decrease risk of atherosclerosis.

- Sunflower oil provide PUFAs .
- PUFAs and Arachidonic acid compete with cyclooxygenase enzyme.
- So There is decreases production of arachidonic acid-derived prostaglandins and leukotrienes, decreased production of inflammatory cytokines, decreased expression of adhesion molecules.
- Sunflower oil (Omega-3 & Omega-6 fatty acid) decrease risk of atherosclerosis.

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*Biochemistry Justification***38. Oxidized LDL is important in pathogenesis of atherosclerosis.****39. High HDL level is decrease risk of coronary heart disease.**

- HDL has apolipoprotein A-1 which activate LCET (Lecithin Cholesterol Esterase Transferase) enzyme.
- LCET help in transferring fatty acid from lecithin to cholesterol.
- So there is more formation of cholesterol ester, which has hydrophobic.
- Because of it's hydrophobic property, more esterified cholesterol is internalized into HDL molecule from peripheral tissue and other lipoprotein.
- Also, HDL is very good acceptor of unesterified cholesterol.
- It suggest that HDL is collect cholesterol molecule from tissue as well as from other lipoprotein and drain to the liver.
- This decrease chance of cholesterol deposition, atherosclerosis.
- So, High HDL level is decrease risk of coronary heart disease.

40. Linoleic acid and linolenic acid are essential fatty acid.

- Linoleic (18:2, Omega 6) and Linolenic acid (18:3, Omega 3) are polyunsaturated fatty acid with 2 and 3 double bond subsequently.
- Humans have carbon 9, 6, 5 and 4 desaturases, but lack the ability to introduce double bonds from carbon 10 to the ω -end of the chain.
- This is the basis for the nutritional essentiality of the polyunsaturated linoleic and linolenic acids.
- Linoleic acid is the precursor of arachidonic acid, the substrate for prostaglandin synthesis.
- Linolenic acid, the precursor of other ω -3 fatty acids important for growth and development.
- So, Linoleic acid and linolenic acid are essential fatty acid.

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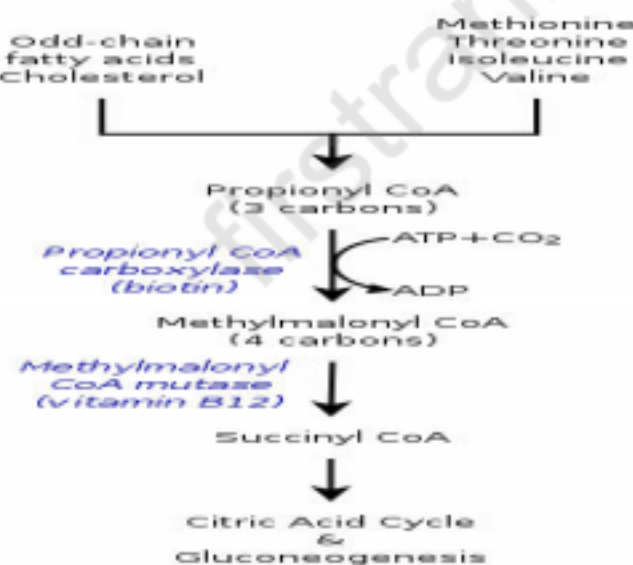
41. Pre-mature baby can suffer from Acute Respiratory Distress Syndrome.

- A baby lung alveoli cell normally begins producing surfactant like dipalmitoyl phosphatidyl lecithine between 24 & 28 weeks of pregnancy.
- At 34 week of pregnancy, baby produce enough surfactant to provide normal breath and lung expansion after birth.
- If baby born prematurely, they may not have enough surfactant in their lungs alveoli.
- Because of insufficient lung surfactant in alveoli, Surface tension inside alveoli increase and make collapse of the lungs alveoli.
- Which causes Acute respiratory distress syndrome.

42. Bile salts are detected in the urine of obstructed jaundice.

- Obstructive jaundice occurs due to obstruction in out flow of bile secretion to duodenum from liver, through gall bladder and common bile duct.
- So there is reuptake of bile component like bilirubin as well as bile salt - bile acid in hepatic circulation.
- So, there is increase bilirubin and bile salts level in blood.
- This high bilirubin and bile salts excreted in the urine.

43. Vitamin B12 Deficiency causes methylmalonic aciduria.



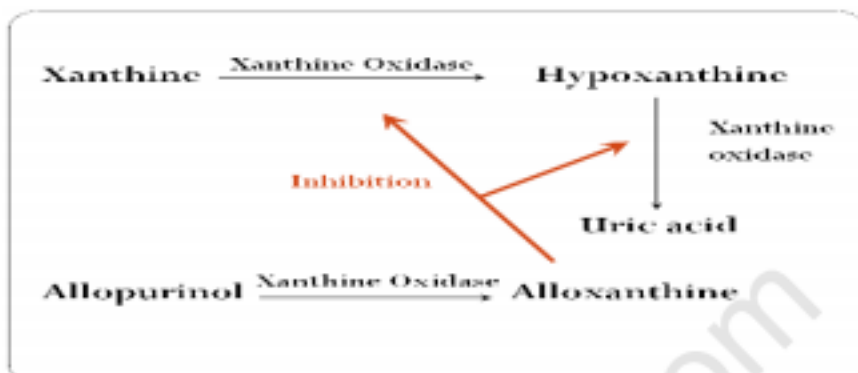
- So, in vitamin B 12 deficiency, there will be accumulation of methyl melonic acid which make neuronal damage.
- it will be excreted in urine.
- That condition is called "Methyl Melonic aciduria"

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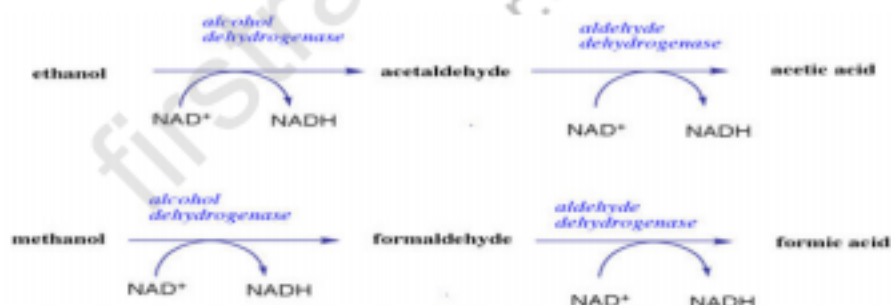
Enzyme

44. Allopurine causes suicide inhibition



- Allopurinol makes competitive inhibition of xanthine oxidase enzyme.
- As well as Allopurinol is converted to Alloxanthine
- Which inhibit the xanthine oxidase of purine catabolism, more potently.
- And reduce formation of uric acid
- So it is useful in Gouty arthritis.

45. Ethanol is use as antidote in methanol poisoning.

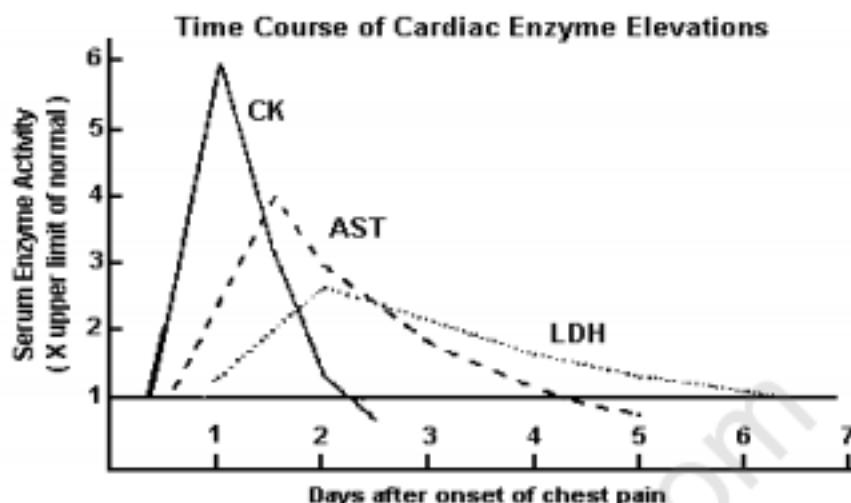


- Ethanol is analogues to methanol
 - Alcohol dehydrogenase has higher affinity to ethanol than methanol.
 - So Ethanol makes competitive inhibition of methanol metabolism.
 - So Decrease production of formaldehyde
 - So Decrease toxicity of methanol
- Therefore, Ethanol is use in methanol poisoning.

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46. "CK-MB is more significant marker than LDH & S.GOT for diagnosis of Myocardial infarction" explain it.



- GOT (AST)
 - Present in Liver, Gall bladder, Cardiac muscle
 - Non specific for cardiac muscle
- LDH
 - Present in Liver, Gall bladder, Cardiac muscle, Skeletal muscle, RBC
 - Non specific for cardiac muscle
- Creatine phosphokinase – MB (CK-MB)
 - Earliest to rise after myocardial infarction
 - Rise within 4-6 hours of the chest pain
 - Specific for cardiac muscle injury

Enzyme	Detectable Rise	Peak value of abnormality	Total Duration of abnormality
CK-MB	4- 6 hours	12 - 24 hrs	2 - 3 days
GOT (AST)	6 - 12 hours	1 - 2 days	4 - 6 days
LDH	18 - 24 hours	2 - 3 days	6 - 10 days

- Enzyme detectable durations in Case of Myocardial Infarction
- CK-MB is rise earlier as well as specific myocardial injury in compare to GOT & LDH.
- So CK-MB is more significant than LDH & GOT for diagnosis of myocardial infarction.

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Nutrition & Vitamins

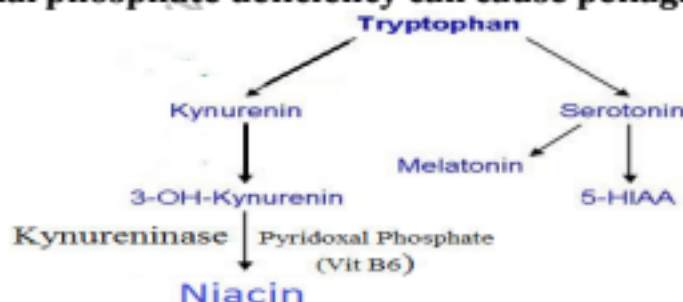
47. Kwashiorkor leads to oedema.

- Kwashiorkor is protein energy malnutrition (PEM)
- So, There is associated with decrease plasma albumin concentration.
- Because of low protein, there is decrease in osmotic pressure and comparatively high hyostatic pressure.
- Because of that, water is shifted from intravascular space to extracellular space
- This is called as Oedema.

48. Vitamin C deficiency can cause scurvy

- Vitamin C is require for activation of Lysyl hyoxylase and Proyl hyoxylase enzyme.
- These, two enzyme, convert lysine and proline into hyoxyllysine and hyoxypoline.
- And there make interchain hyogen bonding (cross l inking) in collagen fiber.
- This cross linking gives strength to the connective tissue.
- Thus, in vitamin C deficiency, connective tissue of vessels, bone as well as of gum tissue loss it's strength.
- That makes gum bleed , superficial vessel damage as well as bone deformities.
- Which is called Scurvy. Vitamin C is require for activation of Lysyl hyoxylase and Proyl hyoxylase enzyme.
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- Thus, in vitamin C deficiency, connective tissue of vessels, bone as well as of gum tissue loss it's strength.
- That makes gum bleed , superficial vessel damage as well as bone deformities.
- Which is called Scurvy.

49. Pyridoxal phosphate deficiency can cause pellagra.

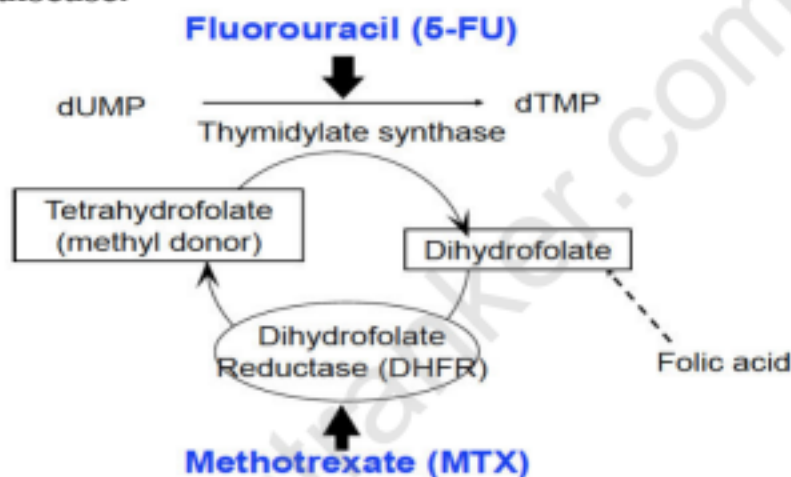


- Because of pyridoxal phosphate deficiency , decrease activity of kynureninase.
- Hence, Pyridoxal phosphate(Vitamin B6) deficiency decrease endogenous synthesis of niacin from tryptophan and increase chance of Pellagra.

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*Biochemistry Justification***Molecular****50. "Mutations are always harmful." True or False, Explain it.**

- Due to the degeneracy property of genetic codon, if third base of genetic codon get substitution type of mutation, than it may represent same amino acid. So that mutation does not make any effect, which is called silent mutation.
- If mutation occur in intron, which is a largest part of DNA, than it does not affect protein synthesis. Because intron does not make any expression for protein synthesis.
- So In both case, There is no any protein structure & function changes.
- So Mutation are not always harmful.

51. Methotrexate (Folic acid analogues) is used to treat neoplastic disease.

- Folic acid is required for purine & pyrimidine biosynthesis.
- Methotrexate is analogous to folic acid.
- So it acts as a competitive inhibitor with dihydrofolate reductase (DHFR) enzyme.
- And decreases the formation of tetrahydrofolate as well as dTMP.
- So DNA replication is inhibited and so it is useful in the treatment of neoplastic diseases.

52. Frameshift mutation is more dangerous than point mutation.

- In point mutation, there is a possibility of only a single amino acid change in protein structure because of the substitution of a single nitrogen base. Which is less dangerous.
- In frame shift mutation, one of the nitrogen bases of a triplet codon is either inserted or deleted.
- Because of that, the reading frame for the triplet codon is completely shifted.
- So the whole amino acid sequence of the required protein gets changed.
- Which causes complete deficiency of that protein.
- Therefore, frame shift mutation is more dangerous than point mutation.

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Biochemistry Justification

53. Telomerase inhibitors can be use in treatment of malignancy.

- After removal of RNA primer from 5' end of new DNA, it became shortened at 5' end in compare to 3' end.
- This 3' end of DNA is called telomere.
- Telomerase enzyme elongate 5' end of DNA in complimentary to 3' telomere end of the new DNA.
- If Telomerase enzyme is inhibited, after each subsequent replication, new DNA get shortened and shortened.
- And decrease life of cell.
- So, Telomerase inhibitors can be use in treatment of malignancy.

54. UV radiation can cause Xeroderma pigmentosum (skin cancer).

- Ultra-Violet rays exposer on skin
- ↓
- "Pyrimidine Dimer" type of DNA Damage
- ↓
- Which prevent DNA polymerase action beyond this dimer.
- ↓
- Damage to DNA
- ↓
- Nucleotide excision repair + UV Specific endonuclease enzyme to repair damage
- ↓
- If there is defect in nucleotide excision repair mechanism or
• UV Specific endonuclease Enzyme deficiency
- ↓
- Can cause Skin cancer = Xeroderma Pigmentosum

55. DNA replication is semi-conservative.

- In DNA replication, There is two new copy of double DNA synthesis.
- In each newly synthesized double DNA, there is one strand from parents DNA and other strand is daughter DNA.
- So it is called semi-conservative.

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