

Phosphorylation

1. Where does fructose come from? Sucrose
2. Where does sucrose come from? Fruit, sweet
3. Everything we eat gets absorbed in the gut and then what comes from the gut goes straight to the liver first.
4. The liver absorbs a lot of glucose but with respect to galactose or fructose, all of it stays in the liver.
5. Fructokinase converts fructose to fructose 1-phosphate using ATP as the phosphate donor.
6. Fructose 1-phosphate is not phosphorylated to fructose 1,6-bisphosphate as is fructose 6-phosphate, but is cleaved by aldolase B (also called fructose 1-phosphate aldolase) to dihydroxy-acetone phosphate (DHAP) and glyceraldehyde.
7. Humans express three aldolases, A, B and C, the products of three different genes.
8. Aldolase A (found in most tissues)
9. aldolase B (in liver, kidney, and small intestine)
10. aldolase C (in brain) all cleave fructose 1,6-bisphosphate produced during glycolysis to DHAP and glyceraldehyde 3-phosphate (see p. 100),
11. but only aldolase B cleaves **fructose 1-phosphate into two components.**
12. DHAP can directly enter glycolysis or gluconeogenesis, whereas glyceraldehyde can be metabolized by a number of pathways.

Metabolism and Disorders

1. There are two things that could happen to glyceraldehyde. It can get phosphorylated by Triose kinase to get glyceraldehyde 3-phosphate into glycolysis.
2. Also Glyceraldehyde can get reduced to glycerol by alcohol dehydrogenase.
3. Glycerol can be phosphorylated to be glycerol 3-P by glycerol kinase.
4. Glycerol 3-P is used to make lipids (phosphoglycerides and triacylglycerols)

5. If you have a mutation in fructose kinase, its really not a big deal because the fructose wont get phosphorylated so it will stay in the blood and as soon as it gets to the kidney, fructose is taken out in the urine.

(Fructosuria is the disease called)

6. The problem is when you have a problem with aldolase B isozyme. In this case fructose gets phosphorylated but then nothing can happen to it after, so its stuck inside the cell and it cannot be metabolized or do anything. It will end up building up in the cell and be toxic to the cell. This is in the liver so you will have all the outcomes that comes with liver disease. The disease is called Fructose Intolerance. Its survivable because you just don't eat any fructose.

Sperm Nutrient

1. Aldose reductase reduces glucose, producing sorbitol.

2. Sorbitol dehydrogenase oxidize the sorbitol to produce fructose.

3. The two pathways from glucose to fructose in the seminal vesicles benefits sperm cells, which use fructose as a major carbohydrate energy source.

4. In lenses, nerves and kidneys, the sorbitol has osmolites which is a compound that binds to water, they like to hydrate themselves, so if you have a bunch of sorbitol here, they are going to bring water into the cell and they become dysfunctional.

5. This is why diabetics loss kidney function, gets cataracts and have tingling in their nerves.

Galactose metabolism and Disorders

1. Where does galactose comes from? Lactose

2. Where does lactose comes from? Dairy, milk

3. Galactose gets phosphorylated in the liver by galactokinase to galactose 1-P.

4. Galactose 1-P reacts with UDP-glucose and they kind of exchanged and you end up with UDP-galactose and Glucose 1-Phosphate by Galactose 1-Phosphate uridylyltransferase enzyme.

5. What can you do with UDP-Galactose? In this case is converted to glucose.

6. What is galactose? It's the C-4 epimer of glucose

7. UDP-hexose 4-epimerase takes UDP-galactose and converts it into UDP-glucose (used to make glycogen)
8. Galactose is used in glycolipids, glycoproteins and glycosaminoglycans
9. Galactokinase deficiency is about the same thing not so harmful because it will go to the blood and then urine and its easy not to eat any dairy products.
10. Galactosemia is the one that is more recognized. It is galactose 1-Phosphate uridylyltransferase deficiency. It's the one that its first screened in newborns because the first thing that will go to a baby's mouth is milk. It causes diarrhea, vomiting and jaundice. Galactose 1-phosphate builds up on the cell and brings water and will have all the symptoms of liver disease.