
Some Interesting Nutritional Biochemistry of Sugars

The Fructose Paradox: “Sweet Poison”



THE BESTSELLING
EXPOSÉ ABOUT THE
HIDDEN DANGERS
OF SUGAR.

SWEET POISON

**WHY SUGAR
MAKES US FAT**

DAVID GILLESPIE

Very sweet sugar

Cheap to produce
(high fructose corn syrup)

Low Glycemic Index

....but, it's a nutritional nightmare!

The Glycemic Index (GI)

Some sugars are good at stimulating a physiological response in blood sugars, others are not

Glycemic Index is a measure of this:

High GI = sharp spike in blood glucose levels

Low GI = slow effect on blood glucose levels

Why is this important? Fairly complex, but basically, blood sugar is the body's main supply of energy.

High blood glucose levels → increased **insulin** production (a hormone produced by your pancreas)

If high levels of insulin are maintained, **insulin resistance** will develop.

Welcome to **Type 2 Diabetes**.

Low GI foods result in a slow and sustained increase in blood glucose → lower demands on insulin production.

Forms of Carbohydrates

Monosaccharides

- The simplest form of sugars
- Found in small amounts in fruit – more abundant in ripe fruit
- The 'sweetest' form of sugar

Disaccharides

- Two sugar units linked together
- Common form of sugar in a lot of food.
- Examples are cane sugar (sucrose) and dairy sugar (lactose)

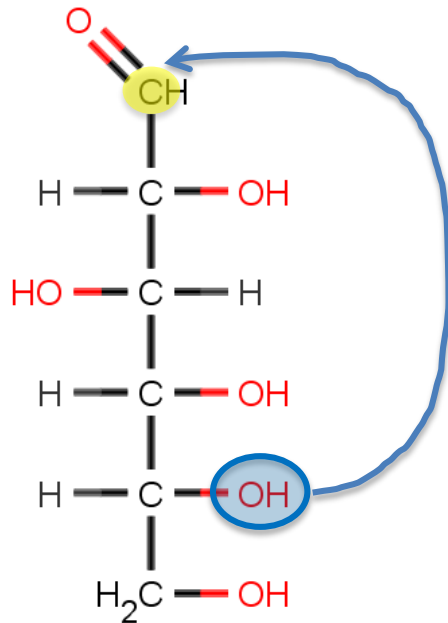
Oligosaccharides and Polysaccharides (mid to low GI)

- Long chains of sugars
- Starch and fiber are good examples

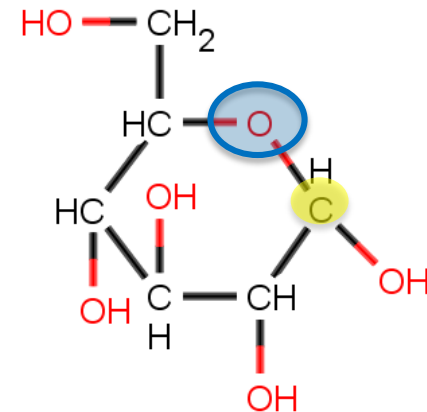
Forms of Carbohydrates

Monosaccharides

- The simplest form of sugars
- Can exist in two forms: linear and cyclic



Linear



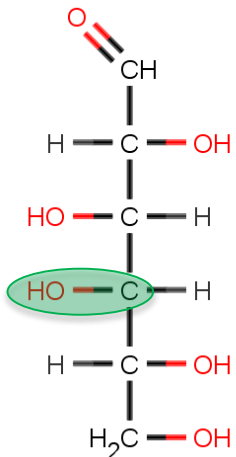
Cyclic

Forms of Carbohydrates

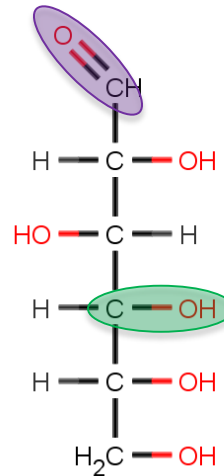
Monosaccharides

- The simplest form of sugars
- Can exist in two forms: linear and cyclic
- Common monosaccharides are all related to **glucose**

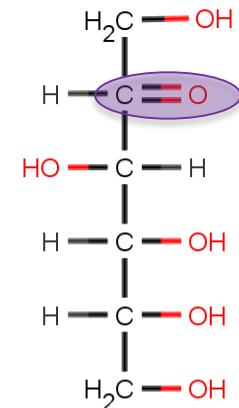
Try drawing mannose, the C2 epimer of glucose.



Galactose



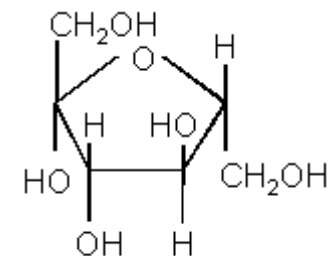
Glucose



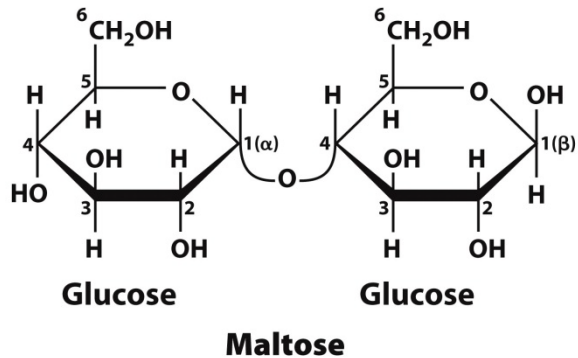
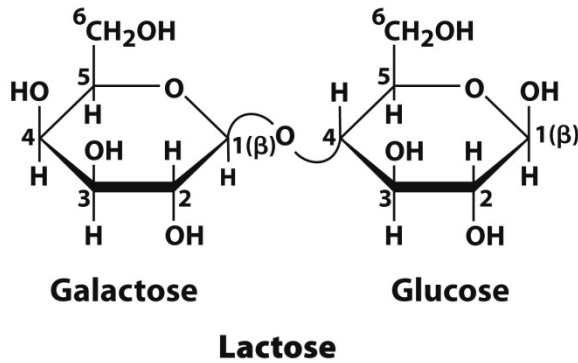
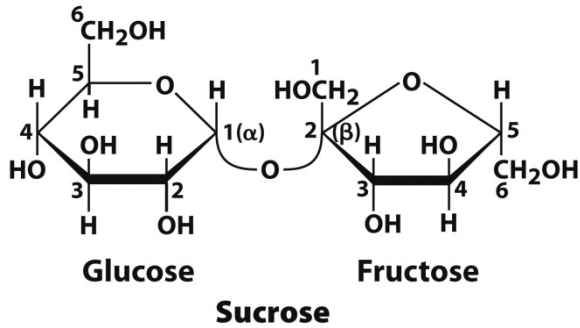
Fructose

Galactose is the C4 **epimer** of glucose

Epimer = the direction of only one **OH** switches

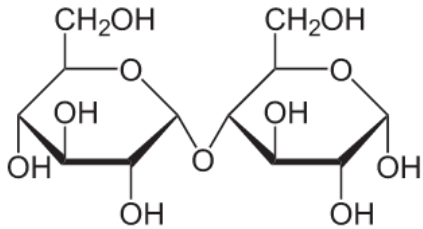


Common Disaccharides

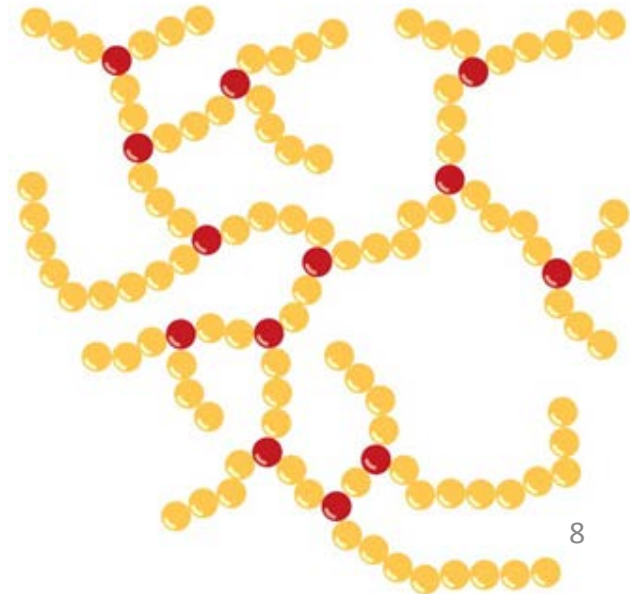
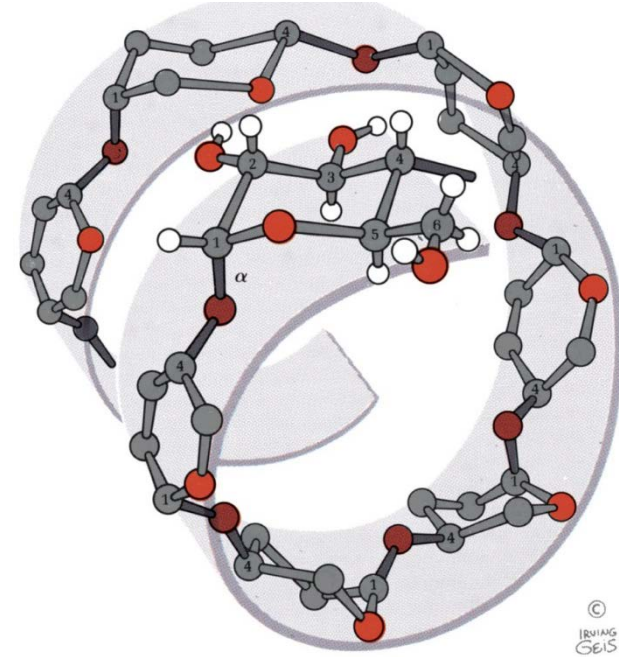
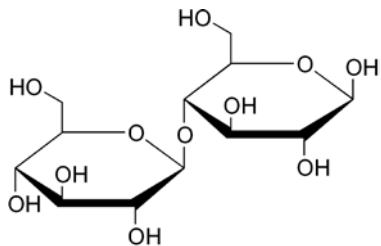


Oligosaccharides

- Polymers of sugar
- Many examples that have very subtle chemical differences but vastly distinct chemical properties



Glucose polymer = starch

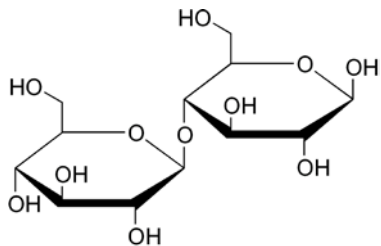
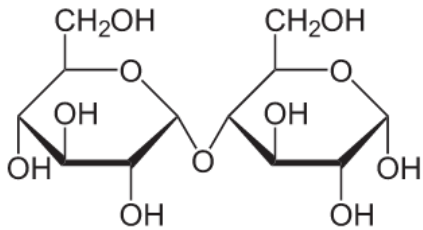


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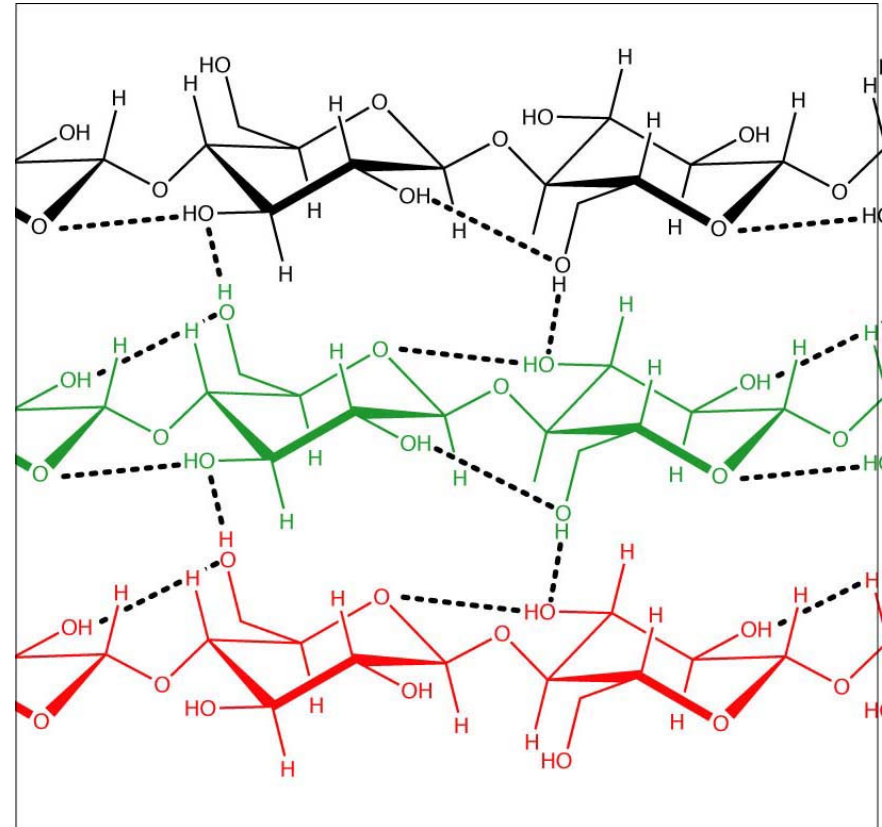
Oligosaccharides

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Non-metabolizable forms of oligosaccharides are collectively known as fiber



Glucose polymer = cellulose

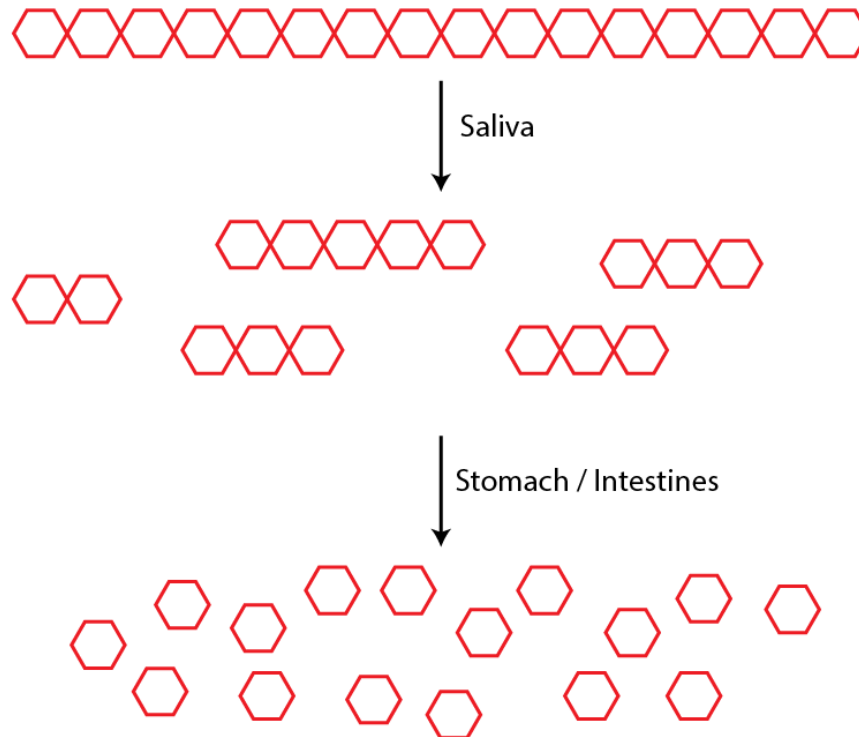


Sugar Metabolism

Goal: Get to Glucose or one of the intermediates

Digestion Bottleneck

Dietary sugar can ONLY be transported into our blood as monosaccharides!



Sugar Metabolism – the role of gut bacteria

Not all oligosaccharides are easily metabolized!

Enter your **gut microbiota** – These bacteria play an absolutely essential function in health

- Digest foods that the stomach and intestine have not been able to
 - Helps with the production of vitamins (B and K)
 - Prevents aggressive and dangerous bacteria from colonizing in your stomach
- Plays an important role in the immune system (barrier effect)

Prebiotics: foods that are fermentable by your gut bacteria (fiber)

Glucose



G6P



F6P



FBP



GAP



13BPG



3PG



2PG

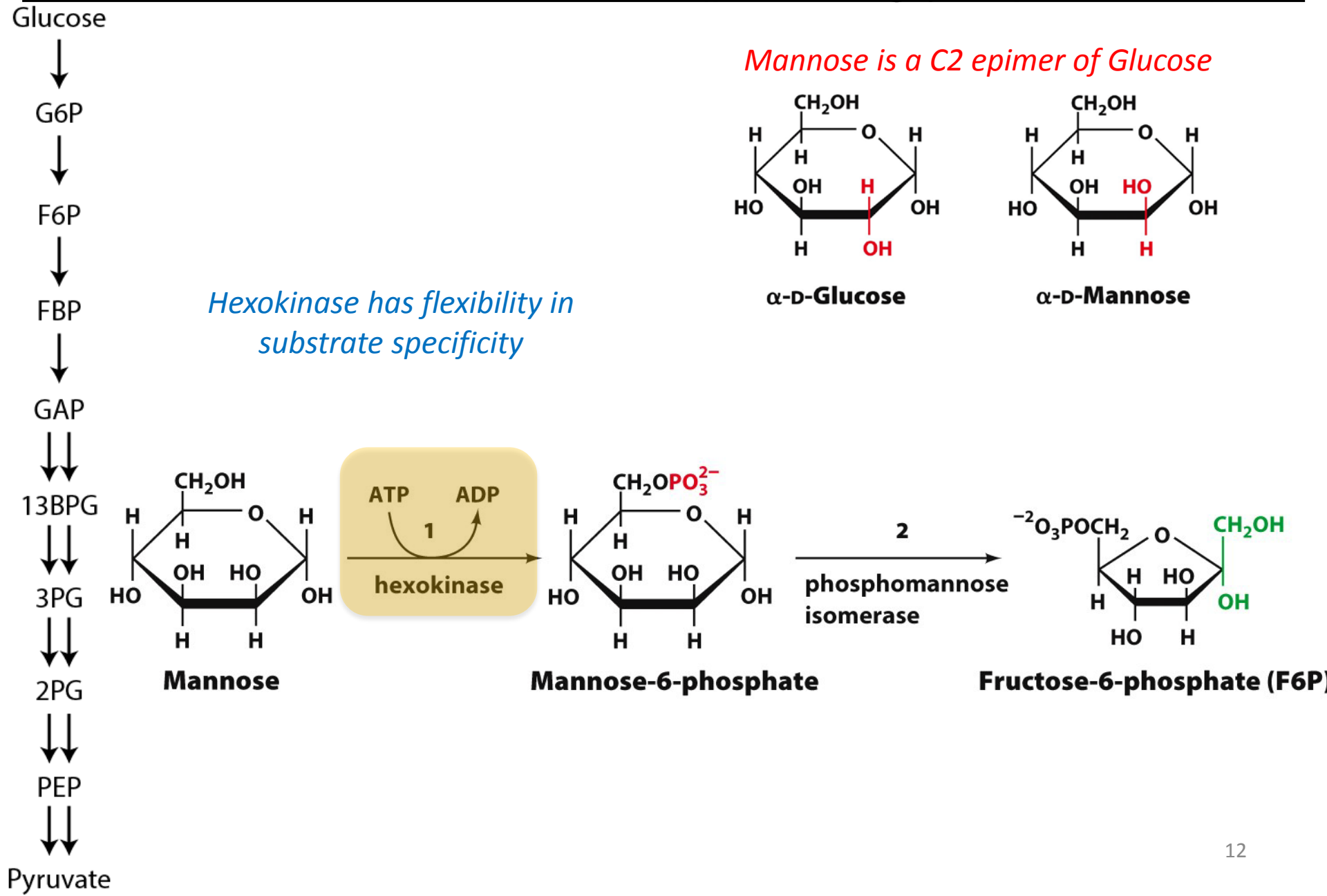


PEP



Pyruvate

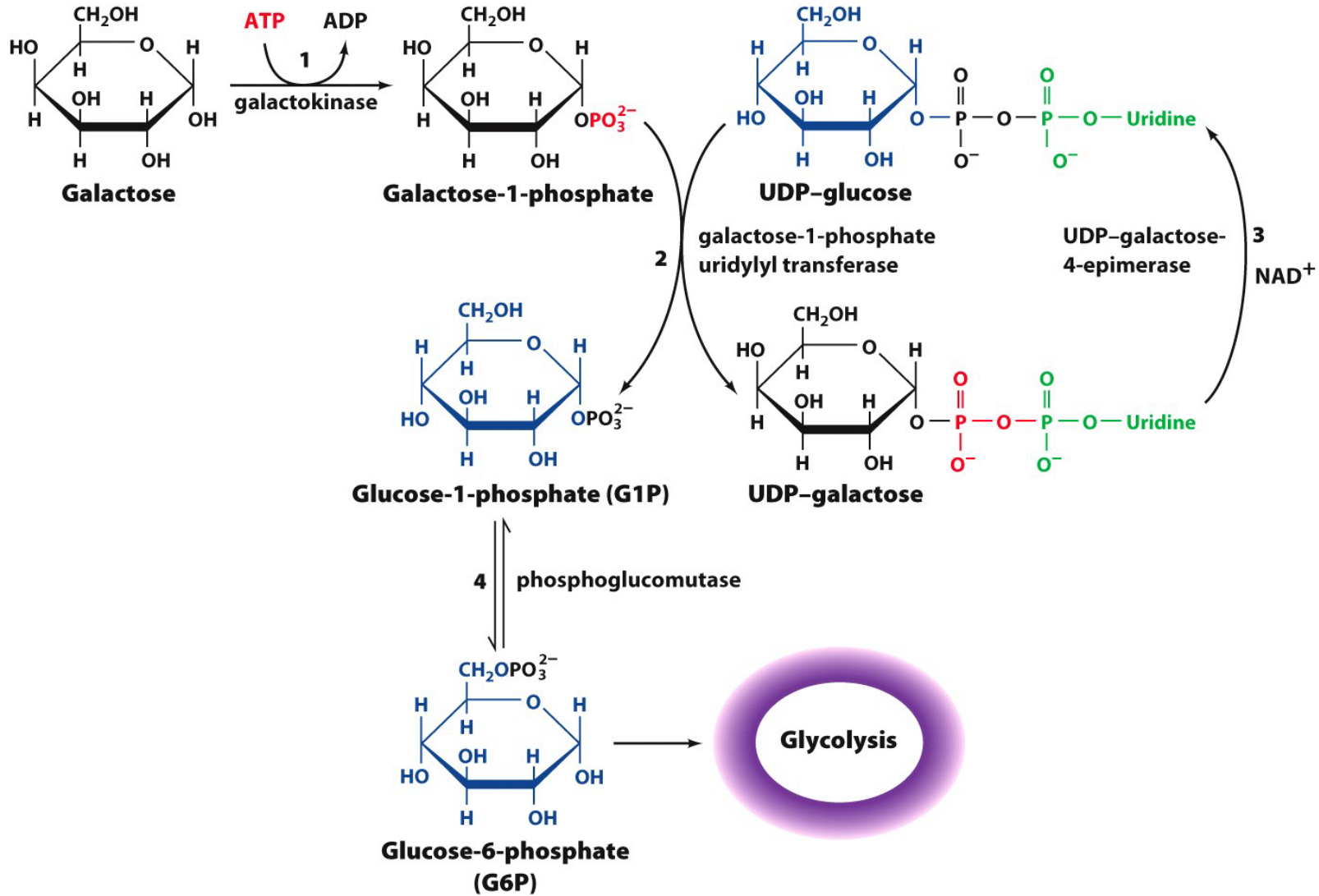
Metabolism of Mannose (part of glycoproteins)



Metabolism of Galactose

Glucose

↓
G6P
↓
F6P
↓
FBP
↓
GAP
↓ ↓
13BPG
↓ ↓
3PG
↓ ↓
2PG
↓ ↓
PEP
↓ ↓
Pyruvate



Metabolism of Fructose

Glucose *Rapid influx of fructose can deplete the liver of ATP leading to acidification of the blood*

