



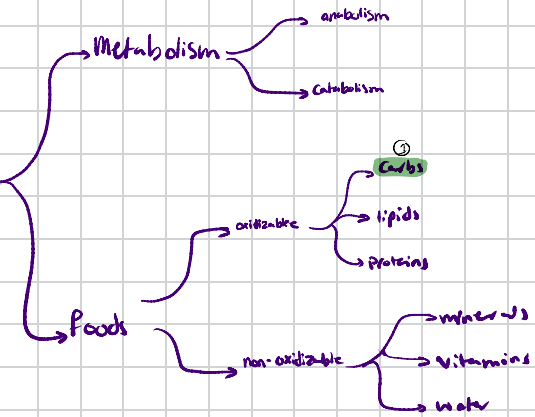
Molecular Biology

Lec : 1

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Lecture 1

BioChem



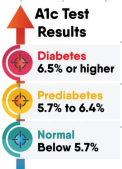
Diabetes

Table 24.1. The plasma glucose levels in OGTT in normal persons and in diabetic patients

	Normal persons	Criteria for diagnosing diabetes	Criteria for diagnosing IGT
Fasting	<110 mg/dl (<6.1 mmol/L)	>126 mg/dl (>7.0 mmol/L)	110 to 126 mg/dl
1 hr (peak) after glucose	<160 mg/dl (<9 mmol/L)	not prescribed	Not prescribed
2 hr after glucose	<140 mg/dl (<7.8 mmol/L)	>200 mg/dl (>11.1 mmol/L)	140 to 199 mg/dl

Box 24.3. Diagnostic Criteria for Diabetes Mellitus

- If the fasting plasma glucose is more than 126 mg/dl, on more than one occasion.
- Or, if 2 hr post-glucose load value of OGTT is more than 200 mg/dl (even at one occasion).
- Or, if both fasting and 2 hr values are above these levels, on the same occasion.
- If the random plasma glucose level is more than 200 mg/dl, on more than one occasion. Diagnosis should not be based on a single random test alone, it should be repeated.



Box 24.6. Criteria for Diagnosis of Metabolic Syndrome

- Elevated waist circumference: (For men >90 cm and for women, >80 cm).
- Elevated triglycerides: >150 mg/dl.
- Reduced HDL ("good" cholesterol): For men, <40 mg/dl; for women, <50 mg/dl.
- Elevated blood pressure: >130/85 mm Hg.
- Elevated fasting glucose: >100 mg/dl.
- Insulin resistance (hyperinsulinemia).
- Additional parameters include: coagulation abnormalities, hyperuricemia, microalbuminuria, non-alcoholic steatohepatitis (NASH) and increased CRP.
- Diagnosis is made, if any 3 out of the 5 criteria given above.

metabolic syndrome

example

central obesity + belly fat

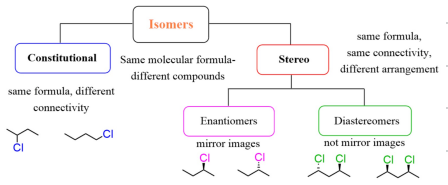
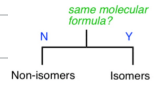
- ↑ waist circumference or belly fat
- ↑ triglycerides
- ↑ blood pressure
- ↑ blood sugar
- ↓ HDL = good cholesterol

isomers

The ability of a substance to present in >1 form

$2^n = \text{number of asymmetric carbon atoms}$

ex: glucose = 6 asymmetric atoms $\rightarrow 2^6 = 64 \text{ isomers}$



note

- chiral \rightarrow can't be super imposed
- achiral \rightarrow can be super imposed

epimers \rightarrow >1 asymmetrical carbon atom, all identical except 1

epimeric carbon

Carbs

- D-Fructose (fruit sugar)**
 - number name: levulose
 - main sugar in sweetener
 - in liver, converted to glucose
 - enters formation of sucrose
- D-galactose (milk sugar)**
 - made in mammary glands
 - converted to glucose in liver
 - enters the structure of glycocalyx in many tissues CNS
- D-mannose** → consists of many glycoproteins

classified according to hydrolysis

- 1 sugar unit → Monosaccharides [can't be hydrolyzed]
- 2 sugar units → Disaccharides
- 3 to 10 sugar units → Oligosaccharides
- > 10 sugar units → Polysaccharides

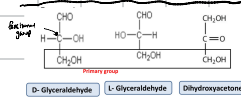


- Importance of hexose:**
 - Evolution "green sugar"
 - It is a better electron carrier (oxidation)
 - It is the most important sugar of carbohydrates
 - It is a store of rapid sources of energy in the body
 - It is the principal sugar used by the brain
 - It is widely present in fruits & vegetables associated with health
 - It is central in the formation of oligosaccharides & polysaccharides
 - It is the main sugar in most tissues, it is converted to all carbohydrates in the body e.g. glycogen, glucose, chitin & fructose
- Functions of ketopentose:**
 - Ribose and deoxyribose enter in the structure of nucleic acids (DNA, RNA, etc.)
 - Ribose enters in the structure of ATP, GTP and other nucleotides (ADP, GDP, etc.)
 - Ribose enters in the structure of coenzymes NAD, NADP and FAD, etc.
- Other notes:**
 - Glucose, alcohols and aldehydes, aldehydes are intermediates in various metabolic pathways to make precursors for glucose metabolism
 - They are components of some vitamins (vitamin B2)

2 Classifications of carbs if you go...

Number of carbons	Aldo sugars (e.g.)	Keto-sugars (e.g.)
3C (triose)	Glyceraldehyde	Dihydroxy acetone
4C (tetrose)	Erythrulose	Erythrulose
5C (pentose)	Ribose, Aldopentose	Ribulose
6C (hexose)	Glucose	Fructose

↳ ketose



D-Glyceraldehyde	L-Glyceraldehyde	Dihydroxyacetone
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Chirality center

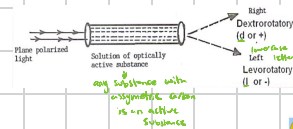
D & L denote the absolute configuration, i.e. D means that OH group on the subterminal carbon atom is at the right but L means OH group on the subterminal carbon atom is at the left.

organic compounds → $\text{C}_n\text{H}_m\text{O}_n$ [n ≥ 3]

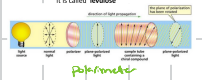
Carbs = Carbon / hydrate = hydrogen / O → Reaction in water

definition → Simple Sugars or its derivative

- polyhydroxyketones
- polyhydroxyaldehydes



- Glucose contains 4 asymmetric carbon atoms. It is dextrorotatory so it is named **dextrose**
- Fructose contains 3 asymmetric carbon atoms. It is levorotatory so it is called **levulose**



importance:

- Polarimetry may therefore be applied for concentration measurements
- Concentration and purity measurements are especially important to determine product or ingredient quality in the **food & beverage** and **pharmaceutical** industries