Biochemistry
Lecture 2

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1. Functional groups, and some examples.
2. Cellular Biochemistry
3. Introduction to:
   - a. CHO
   - b. Ptn + nucleic acid
   - c. Lipids
   - d. Enzymes
   - e. Water

■ Functional group: specific groups of atoms // Intracellular bonds that are responsible for characteristic chemical reactions. * Molecules with same functional groups:
↳ Undergo in same chemical reactions. (size) Regardless

* Common elements: (COP NHS)

Name	Definition	Functional group	Polarity
Hydrocarbons	long chain of C&H ends with	methyl $-CH_3$	✗
Alcohols	Characterized with -OH	Hydroxyl $-OH$	✓
Organic phosphate	// // ($-PO_3$) eg. ATP&DNA	organic phosphate $R-\overset{O}{\overset{\|}{P}}(=O)-O-$	✓ + Acidic (-tive)
Carboxylic acid = Organic acid	// // ($-COOH$) + often aromatic.	Carboxyl $-COOH$	✓ + weak acid
Amines	// // ($-NH_2$) eg. Ammonia (NH_3)	Amino $-NH_2$	✓ + weak basis
Aldehydes	// // $-CHO$	Aldehyde $-CHO$	✓
Ketones	// // $R-\overset{O}{\overset{\|}{C}}-R$	Ketone $R-\overset{O}{\overset{\|}{C}}-R$	
* Back to	slide (6) for more	functional groups.	

Metabolis = Anabolism (synthesis) + Catabolism (Breaking down)
↳ Series of reactions; (A) + (C) →

* Selection of A/C depends on state of cell activity.
e.g.: * growth ⇒ (Anabolism)
* Muscular contraction ⇒ (Catabolism)

■ Cell&Biochemistry: chemical compistions are similar for both (Eu/Pro) karyotes. (Bio-chemical molecules)

Micro (A)
1- Monosaccharides
2- Amino acids
3- Fatty acids
4- Nucleotides

Micro & Macro are in Dynamic state
(A ⇌ B)

Macro (B)
1- Poly saccharides
2- Proteins (Ptn)
3- Lipids
4- Nucleic acids (DNA + RNA) (1)

Carbohydrates = 4 kcal/g

A) **Monosaccharides:**
- general formula → $(CH_2O)_n$
- Types: Trioses, Tetroses, ... (3-7)
- All contain: (-OH) + (CHO / R-C(=O)-R)
- Forms in nature: linear + Cyclic
- Q* Anomeric carbon?
  A: Carbon of functional group in cyclic form
  ↳ = Haworth Projection

B) **Disaccharides:**
- Forms when: anomeric carbon (intermolecular) → (-OH) of other sugar
- Bond: Glycosidic bond
- Reaction: Dehydration = Condensation
- E.g.: Maltose (2 glucoses)

C) **Polysaccharides:** polymer of monosaccharides.
- Created without template.
- Types: Linear / Branched
- Differential agents:
  1- Identity of monosaccharides
  2- Length of chain
  3- Branching degree
- E.g.:
  - Starch = [illegible]
  - Cellulose
  - Glycogen

Enzymes:
- Biological molecules Catalyzing chemical reactions.
- In Enzymatic reactions:
  Substrates (reactants) → Products

Q- How does it work?
A- By decreasing ↓ activation energy

At where catalysis takes place.

Enzymes (6) based on the reactions
- Oxido-reductases
  - Catalyze (oxidation / reduction)
- Trasferases
  - Transfer a functional group
- Hydrolases
  - Hydrolysis of bonds
- Lyases
  - Cleave bonds by means other than hydrolysis & oxidation.
- Isomerases
  - Isomerization changes
- Ligases: Join (2) molecules with covalent bond.

Amino acids + Protein
- Amino acids are (the) building blocks of Ptn (protein)
- Drawn forms:
  Un-ionized ⇌ Zwitte-ionic
- Bond between them: peptide bond
- Reaction: Dehydration / condensation

Ptn: Compound of one / more polypeptides.

Polypeptides:
* single linear polymer chain of amino acids, bonded by peptide bond between Carboxyl and amino groups.

Nucleotide & Nucleic acids
Nucleotide: Molecules join to make up the individual structural unit of nucleic acids

Its components:
- phosphate group
- Nitrogenous base
- Ribose / Deoxyribose

RNA ← (U / T) → DNA

*Ptn + Nucleic acids are most impact macromolecules

C≡G | A=T/U

(is long term storaged) (KEDA) Vitamins

- Types: Fat, Waxes
  - Ester of: 3 * fatty acids + 1 * glycerol → Ester of // (long chain)
  - saturated fats
  - unsaturated fats
  - // → * has ↑ melting point.
- * Some essential fatty acids: Lenolic + Lenolenic
- * In Compound lipids:
  (1) Fatty is replaced
  E.g.: phospholipids
  FA → replaced with phosphate → Polar

Steroids:
have ↑↑ H:C ratio
eg: cholesterol, hormones
- Testosterone
- Estrogen

Water (common solevant)
- Reason of its all properties: Hydrogen bonds

High Cohesion
- High surface tension → Insects run on water
- Strong capillary action → Higher level in straw

High specific heat capacity
* It takes a lot of energy to change (↑) of water

- When water freezes → arranges at ↓ Density ← ↑ Volume ← hollow cells
- So, Ice float on water.