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***College of Pharmacy
third level***



practical lab.(5) (Lipids)

Lipids

- It is a group of heterogeneous organic compounds that do **not dissolve** in **water** and **dissolve** with non-polar solvents such as **alcohol**, **ether**, **chloroform**, and Carbon tetrachloride **CCl₄**. It makes up **50%** of the composition of a living cell.
- Fats contain **C**, **H**, **O**, and some of them contain **P** and **N**.

The most important functions of lipids

- energy source.
- Provides the body with essential fatty acids necessary **for growth**.
- **Protecting** the internal organs in the body such as the **heart**, **kidneys**, and **spleen**. keeping them from shocks.
- **A source** of fat-soluble **vitamins** (**A**, **D**, **E**, and **K**).
- It enters into the **cell structure**, especially the cell membrane.

Classification of Lipids

- The fat is classified into:-



(Simple Lipids)



(compound Lipids)

1- Simple Lipids : They are esters produced from the reaction of **fatty acids** with **alcohols**.

- **include:-**

- **Fat and Oil:** It is the most common fats in nature. These are **glycerol esters (triple alcohol)**. **Hydroxyl** (with **monohydroxy fatty acids**).
- **Waxes:** Such as **bees wax**, which are **esters** of long-chain **fatty acids** with **alcohols Monohydroxylate**.

2- compound Lipids :

- They are esters produced from the reaction of fatty acids with alcohols, and include in their composition molecular groups that contain phosphorous or nitrogen.
- **Include:-**
- **Phospholipids.**
- **Glycolipids.**
- **Lipoproteins.**



Experiments

1- Copper Acetate Test

This test is used to distinguish between saturated and unsaturated fatty acids and Triglycerides.



Experiments

1- Copper Acetate Test

- Principle:

This experiment is based on the fact that free saturated fatty acids combine with copper acetate to form **Copper salts**. In the lower water layer is **Bluish green** copper precipitate. While unsaturated fatty acids give **green** copper salts in the upper layer of petroleum ether.



Experiments

1- Copper Acetate Test

Method:

- In a test tube, place a few drops of lipid and 5 mL petroleum ether, then add 3 mL copper acetate. $(\text{CH}_3\text{COO})_2\text{Cu}$
- Shake the mixture well, then leave the tube until the mixture separates into two layers and note the following: -



Experiments

1- Copper Acetate Test

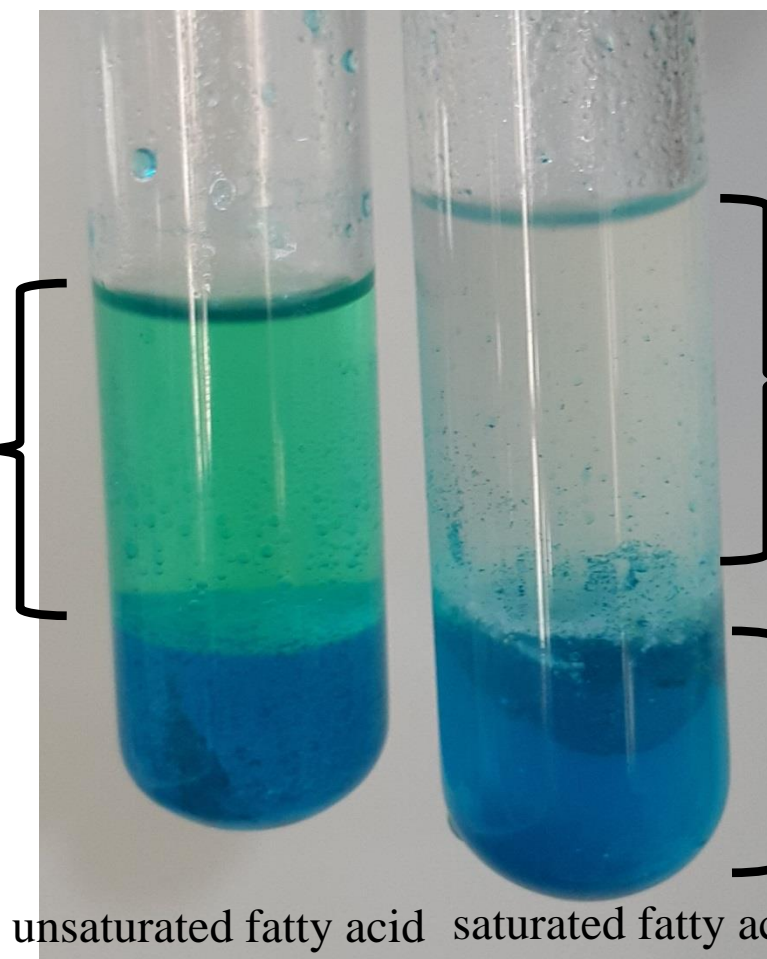
Method:

- If the ethereal **upper layer** appears **green** and the aqueous **lower layer** appears **blue**, the fat is **unsaturated** fatty acid.
- If the **upper layer** remained **clear** and without color with the appearance of a **greenish blue** precipitate in the **lower layer**, the fat was **saturated** fatty acid.

Experiments

Copper Acetate Test

The ether layer is dissolved in the oil



the upper layer remained clear and without color

copper acetate
 $(\text{CH}_3\text{COO})_2\text{Cu}$

unsaturated fatty acid saturated fatty acid



Experiments

2- Salkowski reaction:

This reaction is specific to cholesterol.

Principle:

The Salkowski's test for **cholesterol**, where it interacts with concentrated sulfuric acid (H_2SO_4) that absorbs water and forms two products, one dissolving in **sulfuric acid** and the other in **chloroform**.



Experiments

2- Salkowski's reaction:

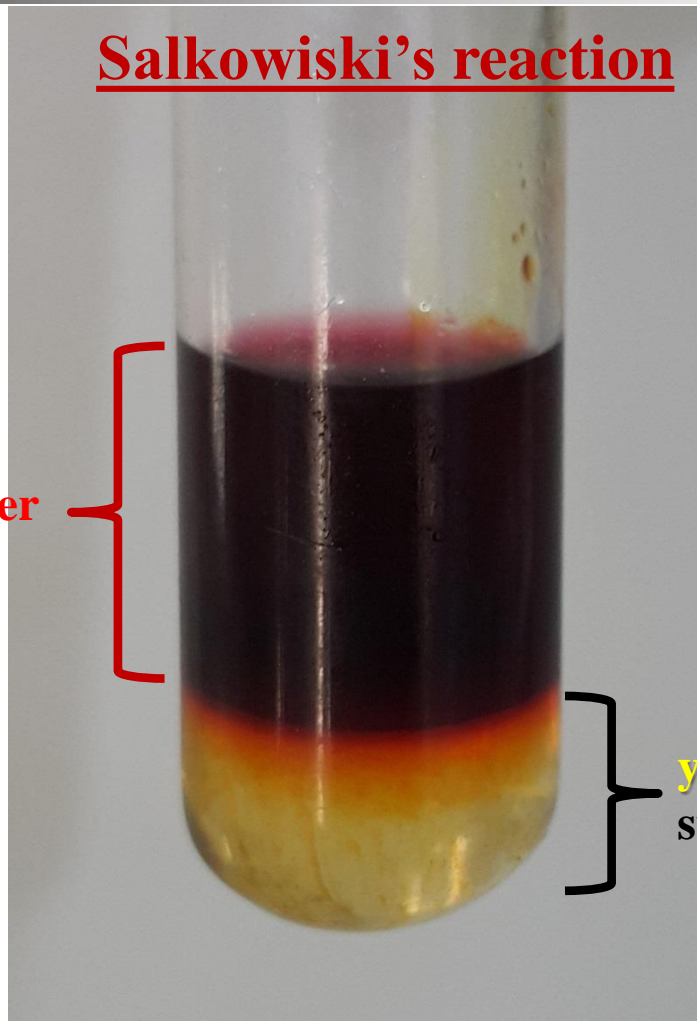
Method:

- put in test tube, 2 ml of a **chloroform cholesterol** solution + 2 ml of slowly **concentrated H₂SO₄** along the side of the test tube.
- Shake the tube well, then leave it until the mixture settles.
- We will notice the formation of two **colored layers**, the **upper layer** which is the **red chloroform layer**, and the **lower** the **acid layer** and it is **yellow**.
- Indicates the presence of **cholesterol**.

Experiments

Salkowski's reaction

red chloroform layer



yellow layer concentrated
sulfuric acid (H_2SO_4)



Experiments

3- Rancidity Test:

It is the detection of unwanted fats and oils left behind for a long time.

It is a chemical change that occurs to fats that are left over for a **long period of time**, to have a distinct taste and smell due to the fatty acids released from them.



Experiments

3- Rancidity Test:

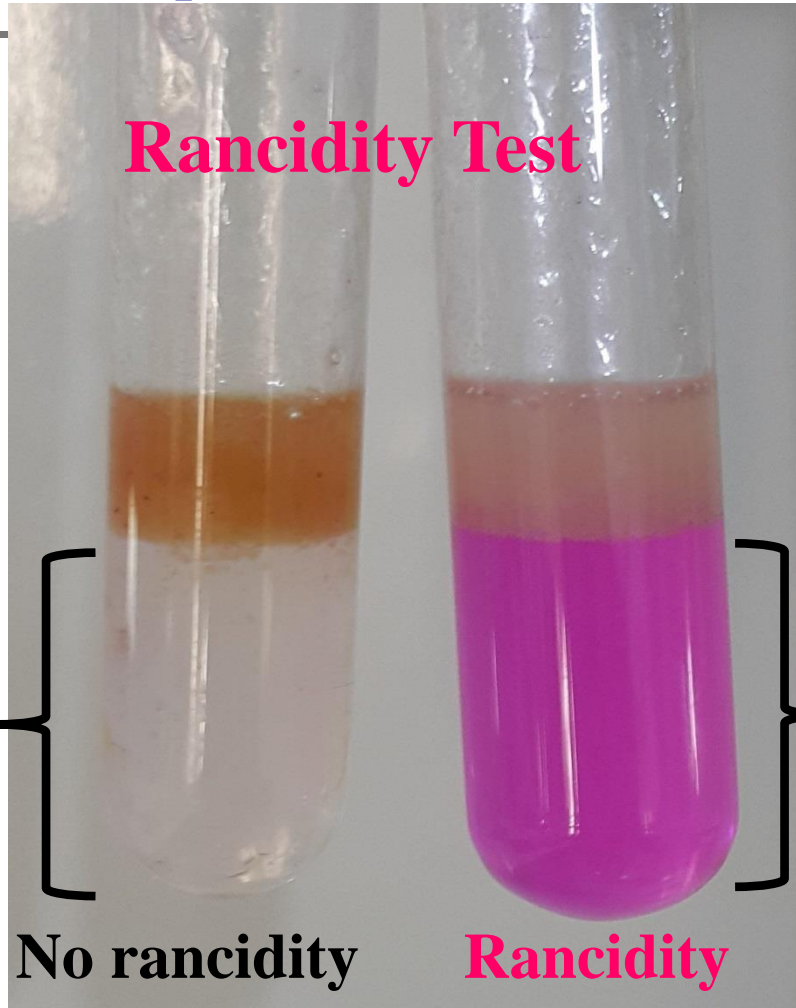
Method:-

- put in test tube, 2ml of NaOH + 3 drops of α -naphthol.
- Add 2 ml of fat or any oil, then shake the mixture well.
- If rancidity is present, it gives a **red** or **pinkish** color.
- If the color appears clear, watery, there is **no rancidity**.

Experiments

Rancidity Test

appears clear, watery



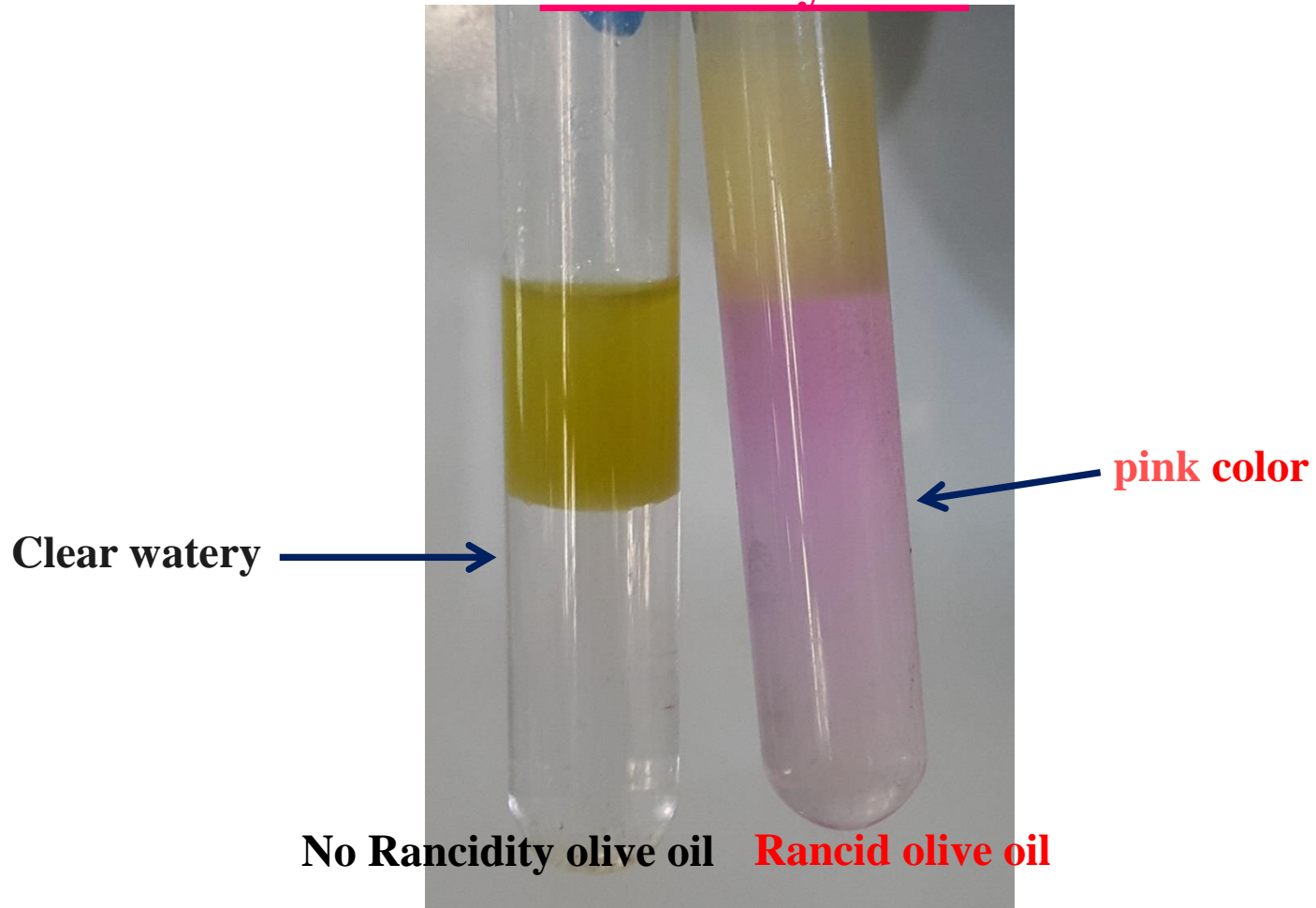
No rancidity

Rancidity

red or pinkish color

Experiments

Rancidity Test





**thank you for
listening**