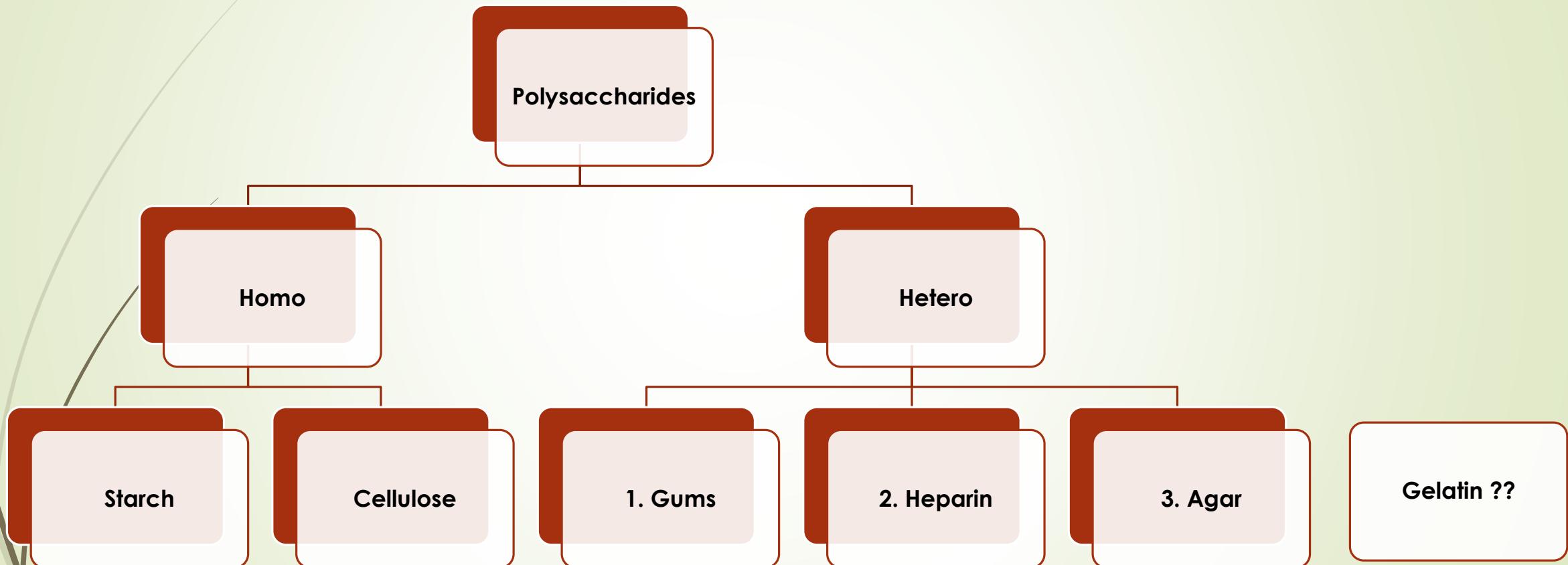
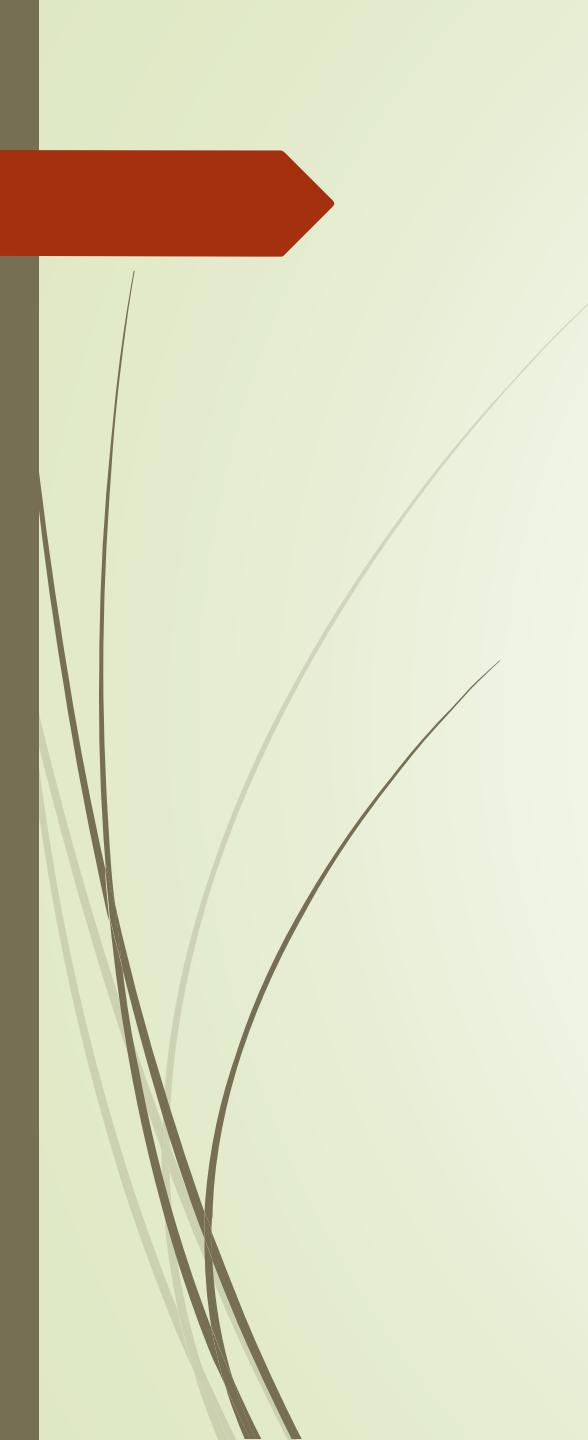


Phytochemistry

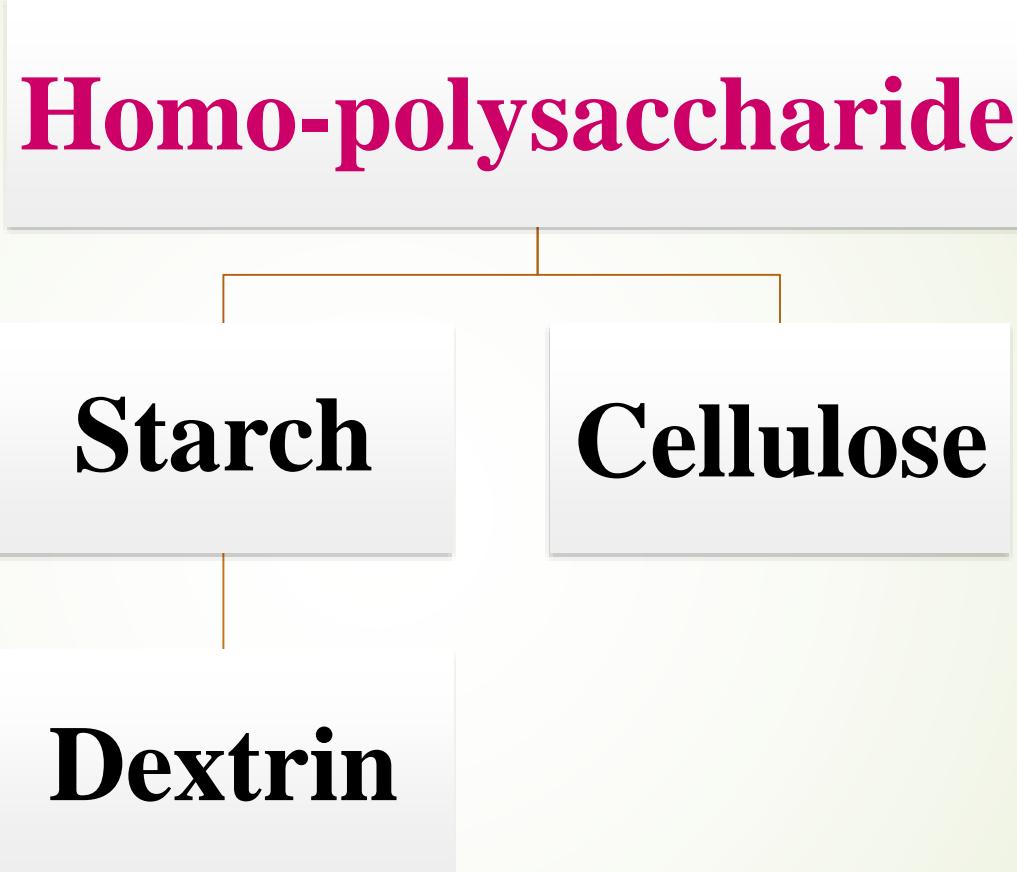
Carbohydrates !

Polysaccharide with pharmaceutical interest





Homo-polysaccharides



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graph TD; A[Homo-polysaccharides] --> B[Starch]; A --> C[Cellulose]; B --> D[Dextrin]
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Cellulose

Dextrin

Starch = Amylum

Polymer of α -1,4/1,6- D-glucose. (energy storage in plants)

Separated into
2 principal
polysaccharides

Amylose
25% of starch
molecule
 I_2 (blue)

Amylopectin
75% of starch
molecule
 I_2 (Violet)

Partial water-soluble
Straight chains (α -1,4-glycosidic bonds).

Water-insoluble
Branched molecule (α -1,4-/ α -1,6-glycosidic bonds).

Maltase enzyme
yields:
(maltose)

Maltase enzyme
yields:
(maltose + dextrin)

N.B: Maltase enzyme hydrolyzes only α -1,4-linked glucose

Tests for identity

I. Microscopic examination:

To detect the source of starch: “maize. Corn or wheat starch”

II. Iodine test:

1

Starch + I_2

Deep blue color

Starch + H_2O $\xrightarrow{\text{Heat}}$

Gel

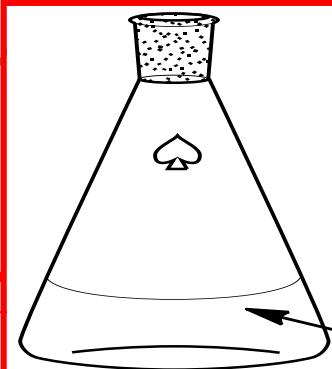
Blue color

Heat

Disappear

Cool

3



Boil on W.B

150 ml starch soln

1.5ml conc H_2SO_4

From time to time
remove a little, cool; then
test with $+ I_2$ solution

5 min.

15 min.

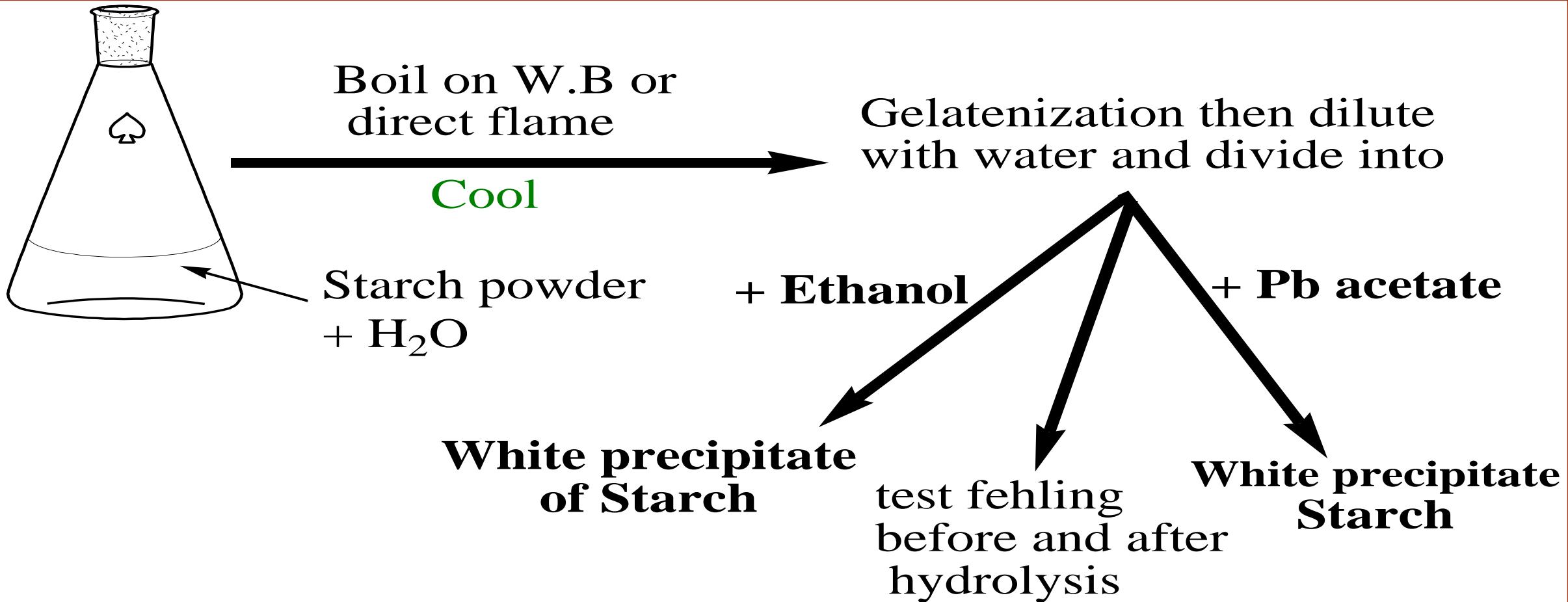
10 min.

Blue/ violet color
Amylodextrin

Red color
Erythrodextrin

Yellow / Colorless
Achroodextrin

III. How to prepare starch solution :





Dextrose

(D-Glucose)

Monosaccharide

Branched
polysaccharide
(1,3/1,6 α-D-Glucose)

Dextran

Think ...!

Dextrin

Branched
polysaccharide
(1,4/1,6 α-D-Glucose)



II. Hetero-polysaccharides

Derived carbohydrates

1. Gums

1. Gums

Gums

**Gum acacia
(Gum Arabic)**

**Gum
tragacanth**

Artificial gum

	Gum Arabic (acacia)	Gum tragacanth	Artificial gum
Source	Natural	Natural	Artificial
Composition	<p>1. Arabin $(Ca^{+2}$ salt of Arabic acid)</p> <p>2-Oxidase enzyme</p>	<p>1-Tragacanthin (polymer of galactose, arabinose, xylose and galacturonic acid), (H₂O sol.)</p> <p>2-Bassorin: (a complex of poly-methoxylated acids), (H₂O insol. = swell in water).</p> <p>3-Galact-uronic acid</p> <p>4-Pentosans; mucilage & starch</p>	<p>1- Dextrin</p> <p>Incomplete (Stepwise) Starch hydrolysis.</p> <p>(complete hydrolysis gives glucose)</p>
Solubility	Soluble (no gel form)	Insol. Gel: (Bassorin)	Insol. (adhesive gel).
Aq. Sol. (optical rotation)	Levorotatory	Levorotatory	Dextrorotatory

	Gum Arabic (acacia)	Gum tragacanth	Artificial gum
Pentose Test:	+ ve	+ ve	- ve
Benzid/H ₂ O ₂ (oxidase)	Blue / greenish-blue	- ve	- ve.
I ₂ test (1 g of powder + 1 ml N/50 I ₂ solution)	Yellowish-brown	Minute scattered blue points due to starch	Reddish-brown
Pb(Ac) ₂	- ve	white ppt.	white ppt.
Pb subAc	white ppt	- ve	- ve
Borax	ppt	- ve	- ve

Test for Oxidase enzyme

► Aqueous solution + hydrogen peroxide + few drops of **benzidine** ; shake → warm at 37°C (enzyme..!).

►►► **blue color or greenish-blue (+ve)**

(oxidase enzyme is present) →
So it is gum arabic (gum acacia)



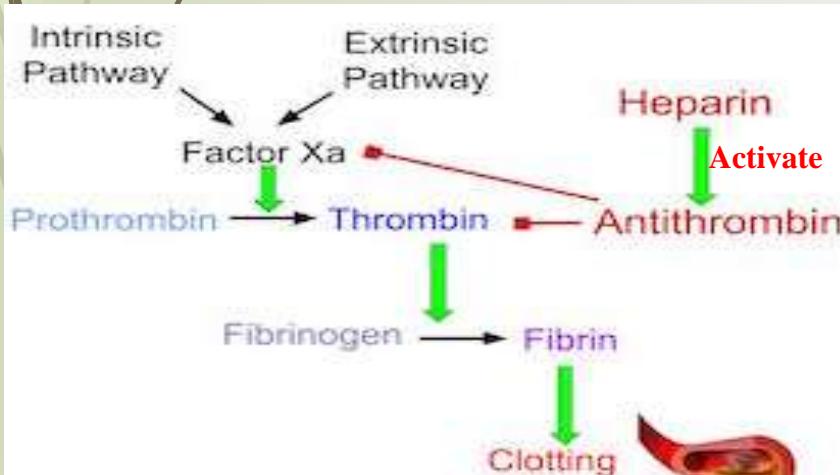
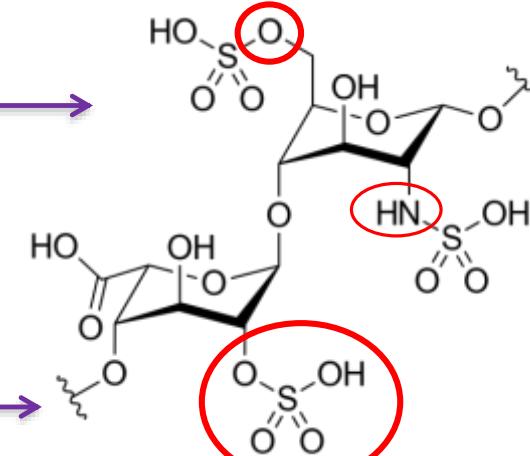
2. Heparin

Polymer with a molecular weight ranging from 3 to 30 kDa,
Glycos-amino-glycan, its an amino-sulfated repeating disaccharide unit

Main 2 units:

6-O-Sulfated - N-sulfated-Glucosamine

2-O-Sulfated Iduronic acid



Current clinical lab. assays for heparin rely on:

- An **indirect measurement of the effect** of the drug, rather than on a direct measure of its chemical presence.
- These include: **activated partial thromboplastin time (APTT)** and **antifactor-Xa activity**.

3. Agar-Agar

Dried mucilaginous substance prepared from red algae.

Ca⁺⁺ salt of sulfated polysaccharide.

It can be resolved into 2 parts:

Agarose

(Galactose-agarobiose), non-sulfated
The principle fraction responsible for the strength of agar

Agarpectin

Sulfated-Galactose

x Insoluble in cold water

✓ Soluble in hot water.



Powder



Sticks and Strips

Gelatin

The protein
that obtained by

boiling
collagenous tissues
of animals
(skin, tendons,
bones)

→ evaporating
the **aqueous**
extract

→ **drying** the
residue in air.

Sheets



???

Powder



Difference	Agar- Agar	Gelatin
1- Nature	Polysaccharide (Galactan = 1,3-linked D-galactose - partially sulphated)	Protein (glutin)
2- Shape	Translucent strips Or granulated powder	Sheets or powder
3- Color	Greyish white with yellowish tint.	Pale yellowish
4- Texture	Tough (hard to break)	Brittle
5- odor	Marine algae odor	slight
6- Taste	Salty mucilaginous taste	slight

Difference	Agar- Agar	Gelatin
Tests for identity:	Boil 1 gm powedr in water to form gell, Then divide the sol. into different fraction to apply the followings reaction:	
a- cooling of hot soln.	Stiff jelly	translucent jelly
b- Tannic acid test:	No precipitate is formed	Brown ppt.
c- Picric acid	-	Yellow
d- Barium chloride	Agar +H ₂ O → boil → + HCl / heat for 30 min. on water-bath → + 1 ml BaCl ₂ T.S.→ white ppt.	 No ppt.

Difference	Agar- Agar	Gelatin
e- Millon's reagent (metallic Hg ²⁺ in dil. HNO ₃)	No ppt.	Brick-red ppt (tyrosine residues “phenolic”).
f - Rhuthenium red test	Particles stained deep red (due to its mucilage content)	No color
g- Soda lime test	-Ve (No NH ₃)	→ NH ₃ gas evolved.
h. I₂ sol.	Reddish Particles	--
i. HCl / heat; neutralize + Fehling test	Red ppt. (Reduction due to galactose)	--

Practical work:

1- I₂ for Starch and Starch's stepwise hydrolysis.

2-Pb(Ac)₂ gum tragacanth.

3- Tannic acid test for gelatin.

4- Test for Identity , BaCl₂ test with agar.

Needed equipments:

1- Test tubes.

2- Dropper.

3- Beaker 250 mL.

4- Lab. towel.



Thanks

