NATIONAL UNIVERSITY OF PHARMACY
Drug technology department

Discipline "Pharmacy-based technology of drugs"

The topic of the lecture :

Solutions of HIGH-MOLECULAR COMPOUNDS (HMC)

A LECTURE FOR ENGLISH STUDENTS of THE 3-RD COURSE IN THE SPECIALTY "PHARMACY"

Edited by associate professor Herasymova I.V.

THE PLAN OF THE LECTURE

1. Definition of HMC
2. Classification of HMC
3. Characteristics of HMC
4. Technology of HMC

QUESTIONS FOR SELF-CONTROL

Areas of Application HMC in pharmacy

References:

1. Tikhonov A.I., Yarnykh T.G., Yuryeva A.B., Garkavtseva O.A. **Chemist's Technology of Drugs: The manual for students of higher schools** / Ed. by A.I. Tikhonov and T.G. Yarnykh. – Kharkiv: NUPh; Original, 2011. – 424 p
2. **Dry, liquid and soft medicinal forms.** A textbook for English students in speciality "Pharmacy" / A.I. Tikhonov, T.G. Yarnykh, A.B. Yuryeva, L.N. Podorozhna, S.S. Zuykina; Ed. by A.I. Tikhonov. – Kharkiv: NUPh; Original, 2011. – 208 p.
3. Tikhonov A.I., Chemist's technology of drugs. **Suspensions.** A lecture for English students of the 3-rd year, speciality "Pharmacy": a handbook for out-of-class work of students / Edited by acad. A.I. Tikhonov. - Kh.: PH of NUofPh, 2009. – 24 p.
4. Tikhonov A.I., Yarnykh T.G., Yuryeva A.B., Podorozhna L.N., Zuykina S.S. **Biopharmaceutics.** Lectures for English students on the speciality "Pharmacy": a handbook for the out-of-class work of students/ edited by acad. A.I. Tikhonov. – Kharkiv: NUPh, Original, 2011. – 140 p.

DEFINITION OF HMC

High-molecular compounds (HMC) are natural or synthetic substances with a huge molecular weight from several thousands (not less than 10000 a.m.u.) to one million and more.

CLASSIFICATION OF HMC

According to the origin
- *natural*
- *synthetic*
- *semi-synthetic*

According to the dissolving ability
- limited swelling substances
- unlimited swelling substances

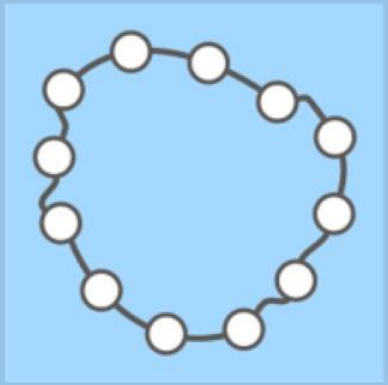
According to the application
- medicinal substances
- auxiliary substances

CHARACTERISTICS OF HMC

The HMC solubility depends on the size and the form of their molecules.

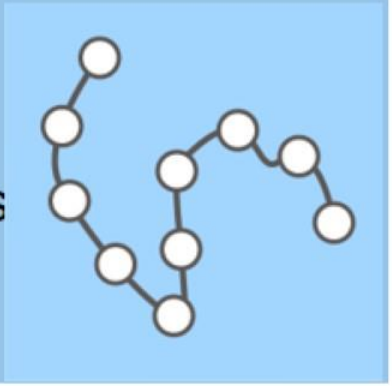
The forms of HMC molecules

Globular (spherical) – compacts spherical compounds:



hemoglobin, glycogen, pepsin, tripsin, pancreatin, etc.

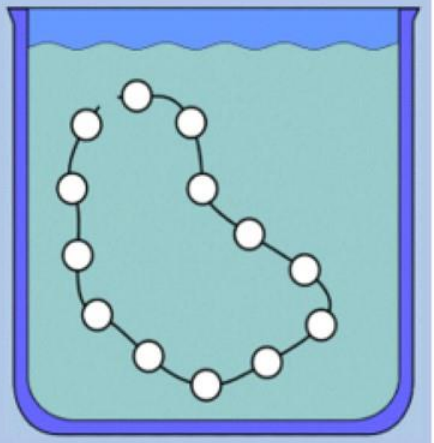
Fibrilar (linear) – asymmetrical bundles of molecules



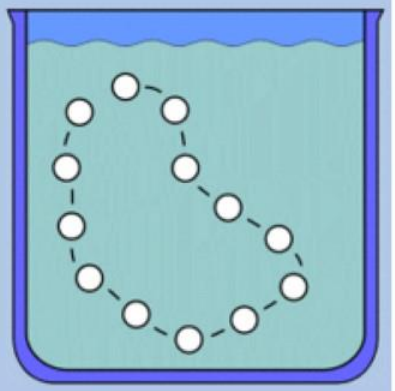
gelatin, cellulose and its derivatives, collagen, etc.

Dissolving of HMC takes place in 2 stages:

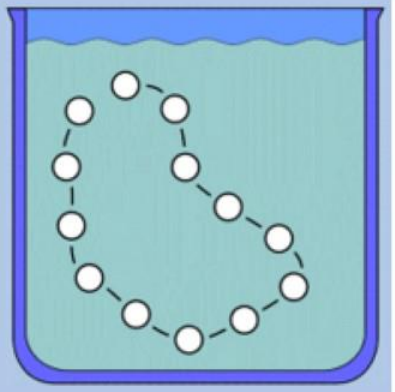
I. Swelling - any process of absorption of large amounts of low-molecular HMC fluids, accompanied by a significant increase in the volume of the HMC.



Unlimited swelling: the process of transition from swelling to dissolution takes place spontaneously



Limited swelling: the process of transition from swelling to dissolution takes place under different factors (the increase of temperature, etc.)



II. Dissolving - diffusion of HMC molecules into a solvent

Technology of HMC.
Solutions of unlimited swelling substances (pepsin, tripsin).

For unlimited swelling substances the process of transition from swelling to dissolution takes place spontaneously.

Pepsin activity seen at pH 1.8-2.0.
In a strongly acidic medium pepsin is inactivated.

Technology of pepsin solution

Preparation of Hydrochloric acid solution → *Dissolving pepsin*

Technology of HMC.

Solutions of **limited** swelling substances (starch, gelatin, methylcellulose).

For limited swelling substances the process of transition from swelling to dissolution takes place under different factors (the increase of temperature, etc.)

Extract of Belladonna	**A strong effective substance (check of doses), HMC with unlimited swelling. Soluble in water and glycerin.**	**Use as a solution of the dense extract (1:2), introduce in the last turn into the bottle for dispensing (dose by drops)**
	***Physical and chemical incompatibility**: precipitation with decoction of Bearberry leaves*	
Gelatin	**HMC with limited swelling in cold water and unlimited – in hot**	**Add 10-multiple quantity of cold purified water, allow to stand for swelling for 30-40 min, then heat on the water bath. The drug is registered for dispensing by the label "Heat before use"**
Methylcellulose	**HMC with limited swelling in hot water and unlimited while cooling**	**Pour by hot purified water (the half amount of the total volume of the solution), after cooling up to the room temperature add the rest quantity of cold water and leave in refrigerator for 10-13 hours for complete dissolution**
Pepsin	**HMC with unlimited swelling**	**Dissolve in purified water, previously acidified by the solution of hydrochloric acid**
Starch	**An amorphous substance. HMC with the limited swelling in cold water and unlimited in hot**	**1 part of starch mix with 4 parts of cold water, add the muddy mixture obtained to the 45 parts of boiling water and boil for 1-2 min**

Test	Explanation
A chemist's shop got the following prescription: Rp.: Mucilaginis Amyli 50,0 Da. Signa. For the enema purposes. How much starch and distilled water did the pharmaceutist use in order to make this preparation? **A** 5.0 g of starch; 45 ml of distilled water **B** 1.0 g of starch; 50 ml of distilled water **C** 2.0 g of starch; 48 ml of distilled water **D** 1.0 g of starch; 49 ml of distilled water **E** 10.0 g of starch; 40 ml of distilled water	There is no concentration of starch in prescription. In this case pharmacist must prepare solution of starch with concentration 2%.

Test	Explanation
A chemist's shop got the following prescription: Rp.: Mucilaginis Amyli 50,0 Da. Signa. For the enema purposes. How much starch and distilled water did the pharmaceutist use in order to make this preparation? **A** 5.0 g of starch; 45 ml of distilled water **B** 1.0 g of starch; 50 ml of distilled water **C** 2.0 g of starch; 48 ml of distilled water **D** 1.0 g of starch; 49 ml of distilled water **E** 10.0 g of starch; 40 ml of distilled water	**For preparation starch solution used 2% concentration** **Starch 2.0 – 100.0** **X - 50.0 X=1.0** **Water 50.0 – 1.0 = 49.0=49 ml**

Infusions from the plant raw material with more quantity of high-molecular compounds are known as: **A** Infusions **B** Mucilage **C** Decoctions **D** Extracts **E** Tinctures	

Infusions from the plant raw material with more quantity of high-molecular compounds are known as: **A** Infusions **B** Mucilage **C** Decoctions **D** Extracts **E** Tinctures	According to definition of Mucilage

If an electrolyte should be added to the solution of HMC, the following takes place: A Gelatinization B Coacervation C Coagulation D Syneresis E Salting out	

If an electrolyte should be added to the solution of HMC, the following takes place: A Gelatinization B Coacervation C Coagulation D Syneresis E Salting out	Salting out - is a process of the HMC isolation from the solution as a flocky precipitate.

QUALITY CONTROL AND STORAGE OF HMC SOLUTIONS

The terms of storage of solutions of HMS depend on properties of medicinal substances, which are prescribed. If there is not the special pointing, extemporal solutions of HMS keep in the cool place protected from light 10 days.

Solutions of HMS dispense in the small bottles of orange glass with additional labels «Shake up before application, «Keep in the cool place protected from light », «Keep out of the reach of children».

Conclusions

1. Definition of HMC was considered.
2. Classification of HMC was studied.
3. Characteristics of HMC were explained.
4. Technology of HMC was studied.

THANK YOU FOR YOUR ATTENTION!