NATIONAL UNIVERSITY OF PHARMACY
Drug technology department

Discipline "Pharmacy-based technology of drugs"

The topic of the lecture :

# COLLOIDAL SOLUTIONS

*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 colloidal solutions
2. Characteristics of colloidal solutions.
3. Properties of colloidal solutions.
4. Technology of protected colloidal solutions.
5. Quality control and storage of colloidal solutions.

# QUESTIONS FOR SELF-CONTROL

Sedimentation, thermodynamic and aggregative stability characterizing the physical and chemical stability solutions protected colloids

# 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. **Solution of high molecular compounds. Colloidal solution.** 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 COLLOIDAL SOLUTIONS*

**Colloidal solutions are ultra*micro*heterogeneous systems, where the structural unit is MICELLE.**
**MICELLE is a complex of molecules, atoms and ions.**

# CHARACTERISTICS OF COLLOIDAL SOLUTIONS

## THE STRUCTURE OF MICELLE

a core (separate molecules of a hydrophobic substance)

the adsorption layer

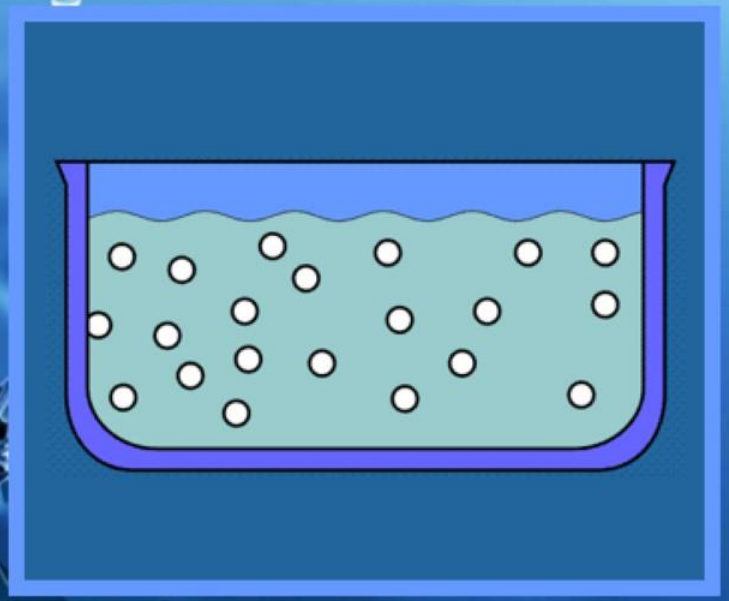
granule

anti-ions, which neutralize the granule

the diffusion layer of ions

# PROPERTIES OF COLLOIDAL SOLUTIONS

1. A poor ability to diffusion.
2. The low osmotic pressure.
3. A poor ability to dialysis.
4. The ability to disperse light in all sides when examining solutions in the ambient light (the characteristic cone of Tyndal will be obtained).



# *PROPERTIES OF COLLOIDAL SOLUTIONS*

5. Micelles in the colloidal solution are in random movement. They are characterized by the Brownian movement.
6. Colloidal solutions are stable sedimentation systems.
7. Colloidal solutions are aggregative and thermodynamic unstable systems.
8. The protected colloids medicines do not pass through physiological diaphragms, therefore, they exhibit only a local action.

# FACTORS WHICH CAUSE INSTABILITY OF THE COLLOIDAL SOLUTIONS

- Adding of electrolytes
- Different types of radiations (light)
- Changing of temperature
- Mechanical action (prolonged shaking, mixing)

**COAGULATION**
(irreversible process) is a process of the integration of disperse phase particles due to sticking them together

# TECHNOLOGY OF COLLOIDAL SOLUTIONS

## PROTARGOL

*Rp.:* *Solutionis Protargoli 2% 100 ml*
*Da. Signa. Drops for nose*

*WCP (front side)*

*Date* *№ of Prescription*

*Aquae purificatae* *100 ml*
*Protargoli* *2,0*
*Vtotal.=100 ml*

*Prepared by:* *(signature)*
*Checked by:* *(signature)*

**Protargol is put on the surface of purified water in the vessel and leave for swelling.**

**The medicine swells, and the particles of protargol gradually dissolving, go down on the bottom of the vessel, giving access to the next portions of purified water to the medicine.**

**If in solution, except purified water, is prescribed glycerin, protargol at first is grinded in a mortar with glycerin and after its swelling is added purified water.**

*It is not recommended to shake up solution of protargol, so as particles sticks together with formation of suds which envelops the particles of protargol and slows its peptisation.*

# TECHNOLOGY OF COLLOIDAL SOLUTIONS

## COLLARGOL

**If prescribed concentration of collargol solution:**

**lesser than 1% -**

**-prepare in the bottle for dispensing, by dissolving collargol in purified water.**

**1% and more –**

**-prepare in the mortar; weight out collargol in a mortar, leave for 2-3 minutes for swelling, grind with little amount of purified water, and add the remaining amount of purified water.**

# *TECHNOLOGY OF COLLOIDAL SOLUTIONS*

## ICHTHYOL

Weigh out ichthyol in a previously weighed porcelain cup, add purified water and dissolve, strain (if necessary) into the bottle for dispensing.

**Glycerine solution of ichthyol:**

Weight out glycerin, measure the purified water, mix the solvent. Weigh out ichthyol in the previously weighed porcelain cup, then add the glycerin solution in several parts with mixing till obtaining homogenous solution.

# STRAINING OF PROTECTED COLLOIDAL SOLUTIONS

*If necessary strain solutions through glass filters No.1 and No. 2.*

*Colloidal solution can't be filtered through a paper filter, so as ions of iron, calcium, magnesium, which are contained in a paper, cause coagulation with the loss of a medicine on a filter.*

# *QUALITY CONTROL AND STORAGE OF COLLOIDAL SOLUTIONS*

**If there is not the special pointing, extemporal colloidal solutions keep in the cool place protected from light, till 10 days.**

Colloidal solutions 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».

| | | |
|---|---|---|
| **Collargol** | **A colloidal substance. 70 % of silver nitrate. Hard crystals with a metallic glitter. A strong effective, light sensitive substance. Slowly soluble in water.** | **Homogeneous liquid MF: Up to 1 % - dissolve in purified water in the bottle for dispensing, if 1 % and more - grind in the mortar adding purified water. Solutions are filtered through glass filters.** |
| | ***Chemical Incompatibility:*** **oxidation of solution of Adrenalin hydrochloride; coagulation in presence with dimedrol.** | |
| **Protargol** | **A colloidal substance (contains 8 % of silver oxide), soluble in water, glycerin.** | **Pour by a thin layer on the surface of the water to complete dissolution. If there is glycerin in the prescription, grind protargol with glycerin, then add water.**<br>**Solutions are filtered through glass filters.** |
| **Ichthyol** | **A colloid, aromatic substance. Ammonium salt of the sulphonic acid shale oil.**<br>**Soluble in water and glycerin.** | **Weight out in a porcelain cup and dissolve in purified water. Solutions are filtered through glass filters.** |

| Test | Explanation |
| --- | --- |
| A pharmacist should prepare of 4 % colargol solution. How should colargol be added to the solution?<br><br>A Grind in the mortar with purified water after swelling for a short time<br>B Put on the surface of the purified water<br>C Put in the bottle for dispensing, add purified water, shake<br>D Dissolve when shaking in purified water using an auxiliary bottle<br>E In the bottle for dispensing measure purified water, add colargol, shake | |

| Test | Explanation |
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| A pharmacist should prepare of 4 % colargol solution. How should colargol be added to the solution?<br><br>A Grind in the mortar with purified water after swelling for a short time<br>B Put on the surface of the purified water<br>C Put in the bottle for dispensing, add purified water, shake<br>D Dissolve when shaking in purified water using an auxiliary bottle<br>E In the bottle for dispensing measure purified water, add colargol, shake | **According to technology of collargol solutions.**<br><br>**If collargol concentration 1 % and more - grind in the mortar adding purified water.** |

# Conclusions

1. Definition of colloidal solutions was considered.
2. Characteristics of colloidal solutions were explained.
3. Properties of colloidal solutions were considered.
4. Technology of protected colloidal solutions was studied.
5. Quality control and storage of colloidal solutions were explained.


THANK YOU FOR
YOUR ATTENTION!