



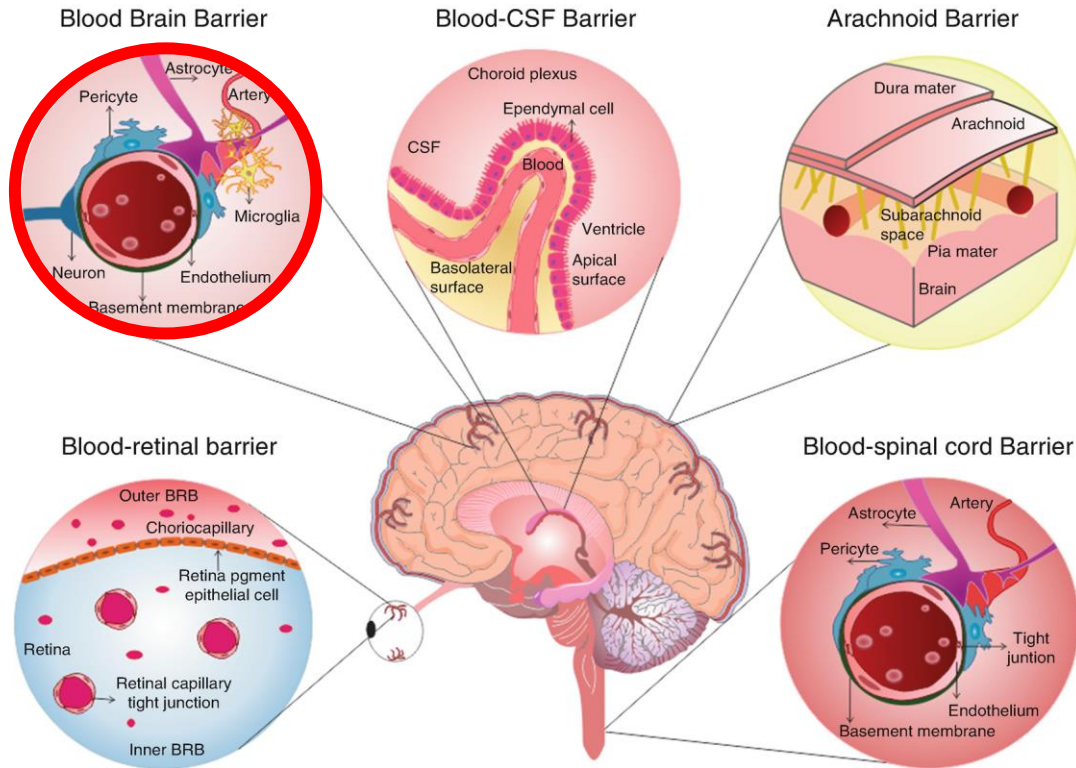
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Biopolymers based membranes for imitation blood-brain barriers

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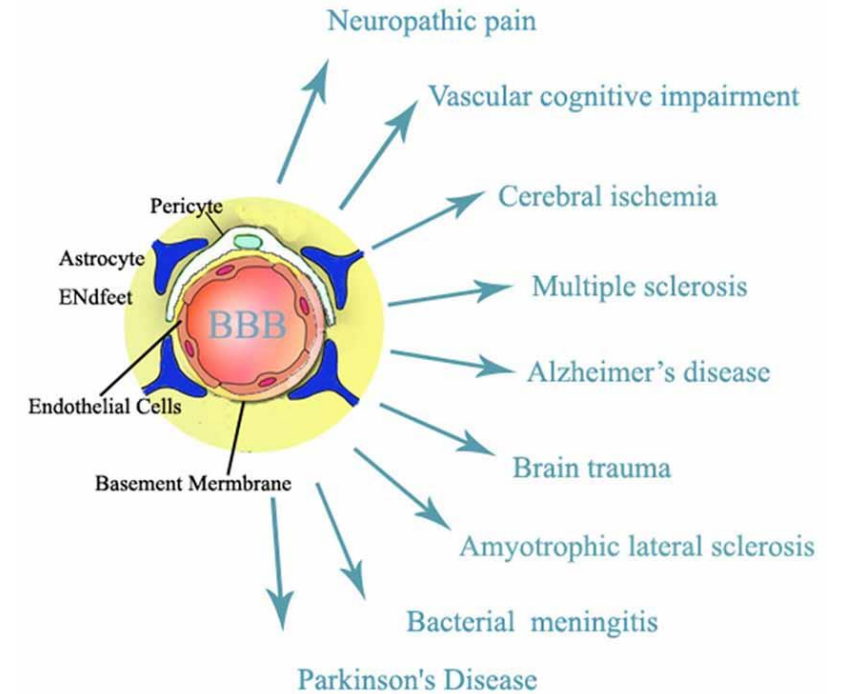
Supervisors: Dr. Vladimir V. Chrishtop, Dr. Sofia M. Morozova

Saint-Petersburg, 2020



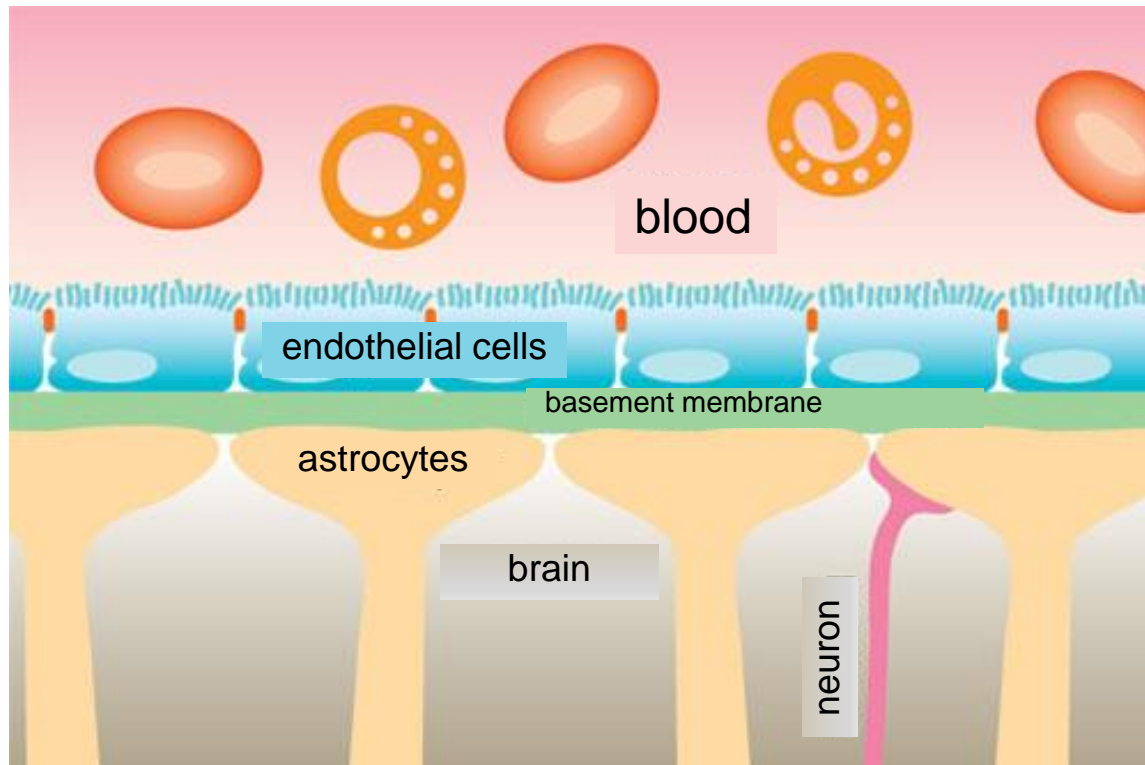
The blood-brain barrier (BBB) is a physiological barrier that actively interacts between the circulatory system and the central nervous system

It is known that the physiological permeability of the BBB is disturbed in various **pathologies** of the **Central nervous system** (ischemia, brain hypoxia, injuries and tumors, neurodegenerative diseases).



Therefore, if scientists can simulate the barrier, they can conduct optimal studies of the **efficiency of drugs**

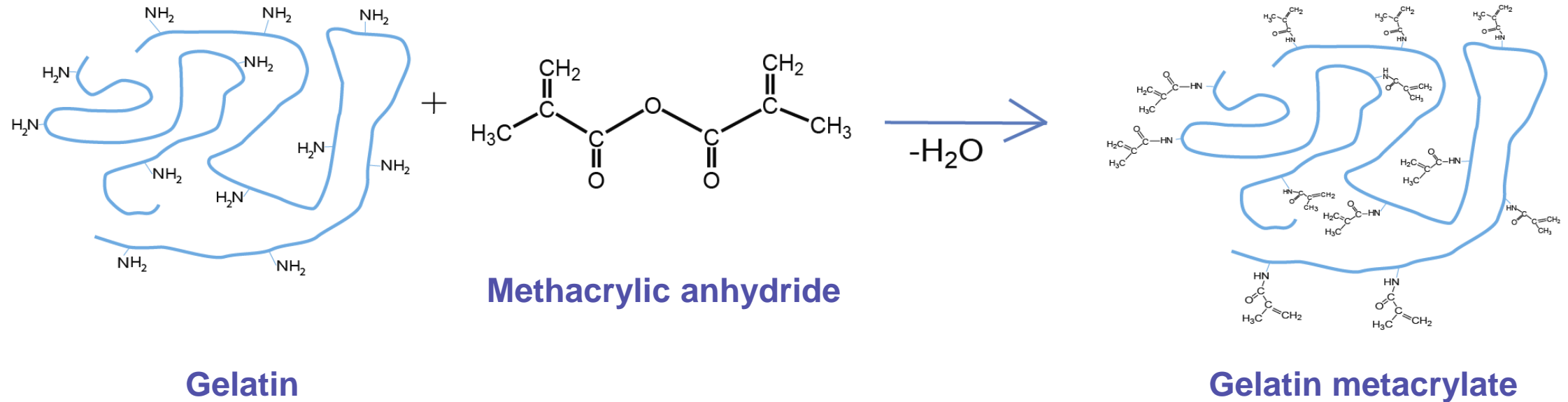
The simulated barrier is composed of membranes and three types of basic cells, astrocytes, endothelial cells, and pericytes

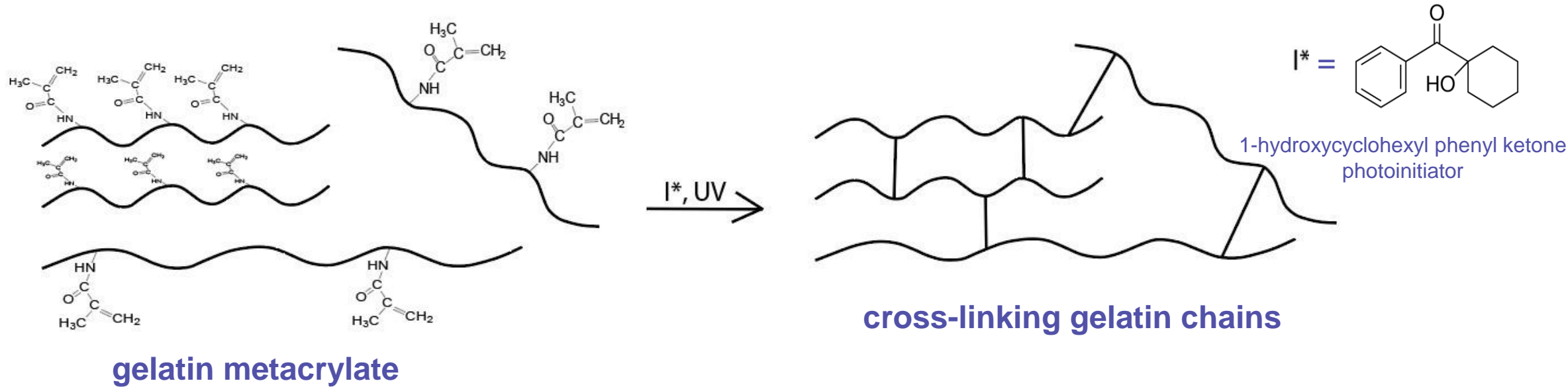


Requirements for the membrane:

- the passage of water and small molecules
- formation of close contact with cells
- control of large molecules passage

Gelatin is a common biocompatible polymer that meets the requirements. Since gelatin is initially water-soluble, we modified it with methacrylate

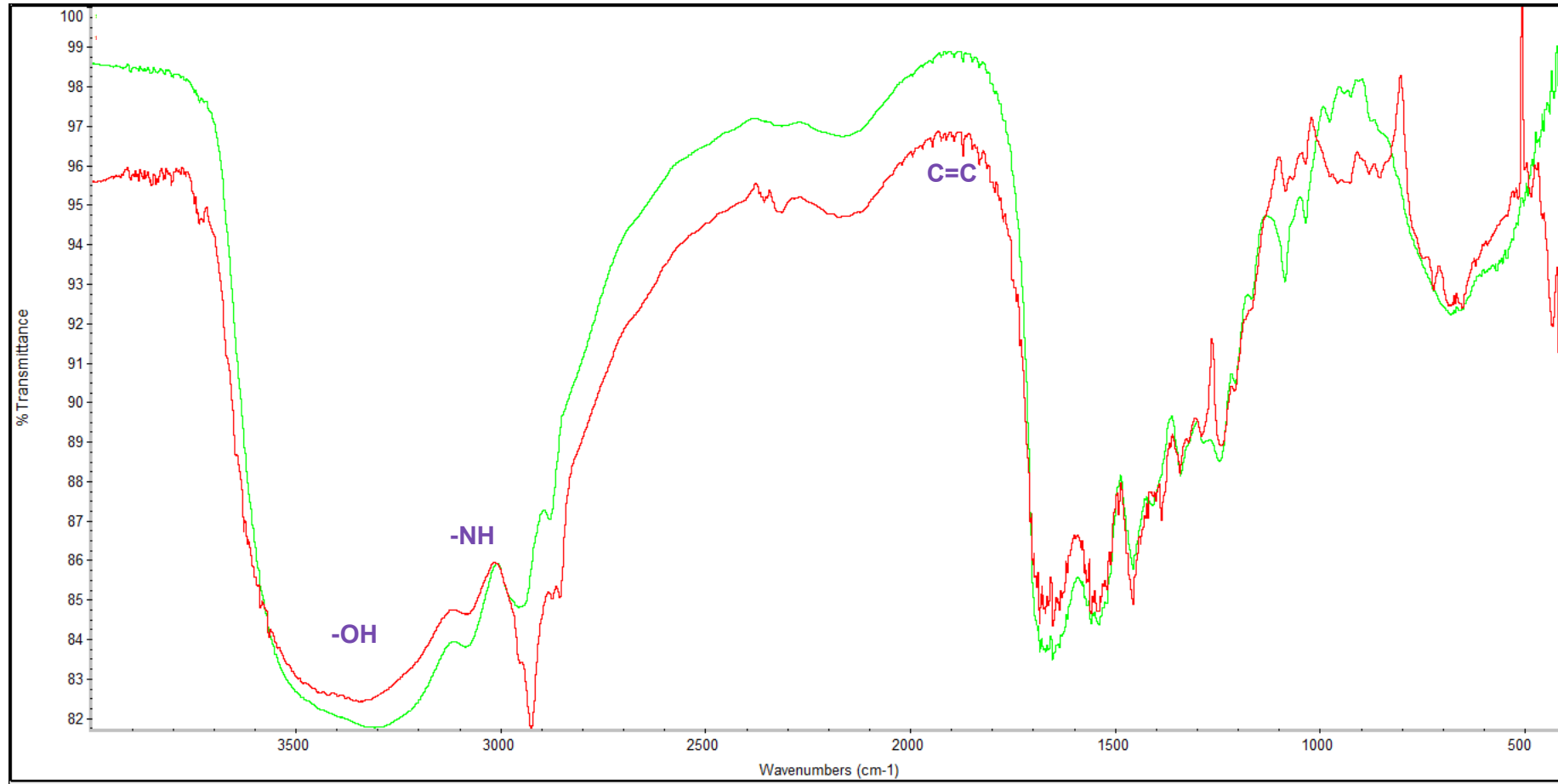


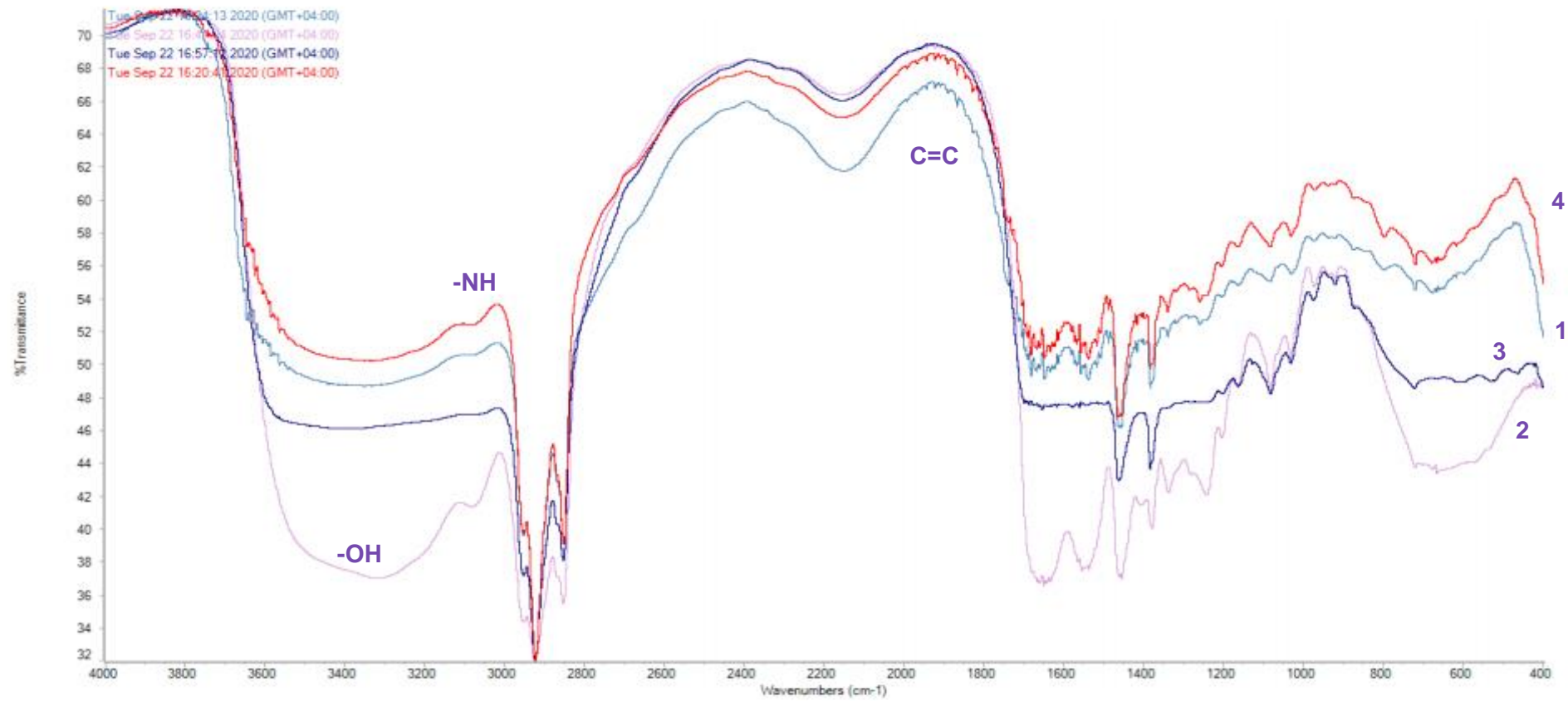


1. 1g GelMa 10% + 0,001g photoinitiator 10 minutes UV
2. 1g GelMa 10% + 0,001g photoinitiator 20 minutes UV
3. 1g GelMa 10% + 0,0005g photoinitiator 10 minutes UV
4. 1g GelMa 10% + 0,0005g photoinitiator 20 minutes UV

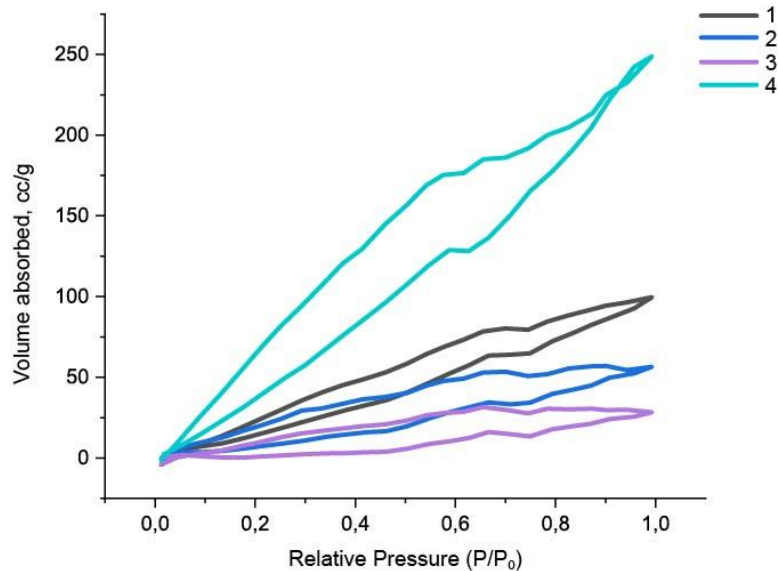
As part of the work, we obtained modified gelatin membranes that differ in the degree of **cross-linking**. The degree of cross-linking was controlled by the amount of photoinitiator used to cross-link the gelatin methacrylate chains and the time of UV-radiation.

GeIMA initial
GeIMA after polymerization





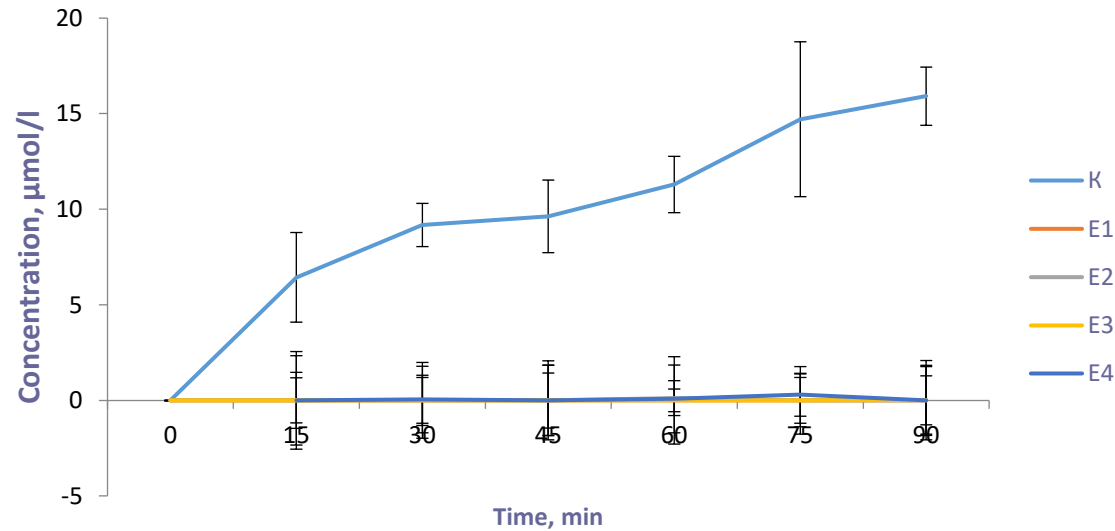
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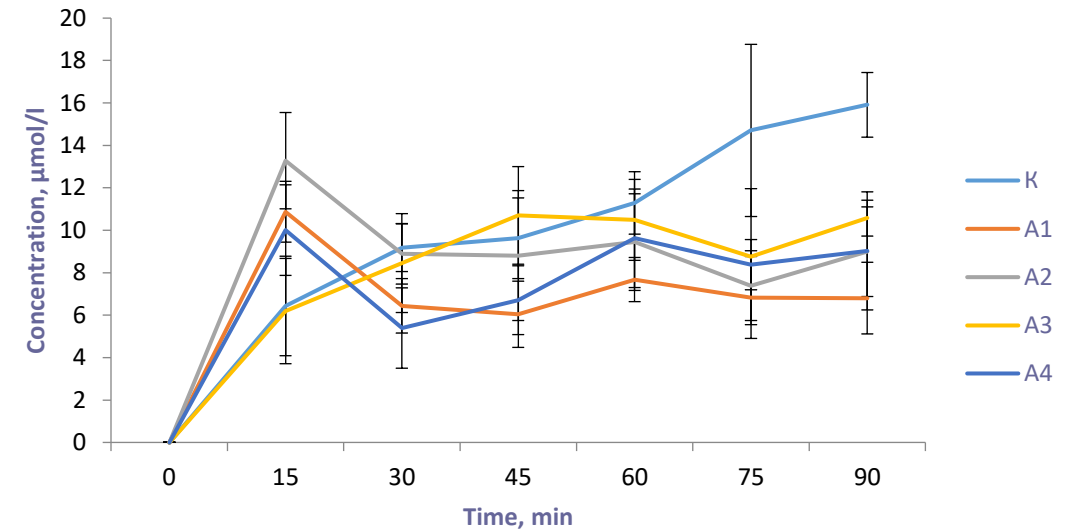
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№	BET	BJH		
	S, m ² /g	S, m ² /g	V, cc/g	D _{pore} , nm
1	109,66	96,48	0,13	4,29
2	44,28	54,77	0,07	4,26
3	0	29,93	0,04	3,19
4	564,94	208,9	0,27	3,51

Concentration dynamics LY (endothelial cells on scaffolds)



Concentration dynamics LY (astrocytes on scaffolds)



- synthesized modified gelatin
- obtained and characterized membranes differing in the degree of crosslinking
- studied biological properties on 3 types of cells. Membrane 1 showed the best results.



SCAMT

Thanks for your attention!

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St. Petersburg, 2020

Acknowledgments: This work was supported by the Ministry of Education and Science of Russia (project No. 075-15-2019-1896)