CHARLES UNIVERSITY
FACULTY OF PHARMACY IN HRADEC KRALOVE

Department of Pharmaceutical Technology

Study program: Pharmacy

Opinion of the Opponent of the Diploma Thesis

Year of the defense: 2023/2024

Student:	**Omran Zamani Gerashi**
Thesis Tutor:	Dr. Georgios Paraskevopoulos, Ph.D.
Consultant:	Dr. Irene Sagrafena
Opponent:	doc. PharmDr. Andrej Kováčik, Ph.D.
Thesis title:	**Factors affecting the microstructure and permeability of lipid model membranes**

Scope of work, number of 46 pages, 17 figures, 4 tables, 96 citations

Evaluation of the work:

a)	Processing of the theoretical part:	Excellent
b)	The complexity of the methods used:	Excellent
c)	Preparation of the methodological part (clarity, comprehensibility):	Excellent
d)	The quality of the experimental data obtained:	Very good
e)	Processing of results (clarity):	Very good
f)	Evaluation of results, including statistical analysis:	Excellent
g)	Discussion of results:	Very good
h)	Clarity, conciseness, and adequacy of conclusions:	Excellent
i)	Meeting the objectives of the work:	Excellent
j)	Quantity and up to date of references:	Excellent
k)	Language level (stylistic and grammatical level):	Excellent
l)	Formal level of the work (text structure, graphic design):	Excellent

I recommend the thesis for recognition as a rigorous thesis ☒

Comments on the evaluation:

The thesis examines the impact of natural moisturizing factors on the microstructure and permeability of lipid membranes modeling the outer layer of the skin, the stratum corneum. The author focused on four main natural moisturizing factor components – pyrrolidone carboxylic acid, urocanic acid, glycerol, and urea – and investigated how these substances influence the lamellar and lateral organization of lipids, their ability to absorb and retain water, and their permeability to model permeants.

The work combines theoretical knowledge of stratum corneum structure and function with experimental methods such as X-ray diffraction, Fourier-transform infrared spectroscopy, and confocal Raman microspectroscopy to better understand the interactions between natural moisturizing factors and lipid membranes.

The study of natural moisturizing factors and their impact on the structure of lipid membranes provides valuable insights for a better understanding of the skin's barrier function. The work effectively combines theoretical concepts with practical experimental methods. The results

are systematically presented, and the discussion, including data interpretation in the context of existing literature, contributes to the scientific value of the work.

The thesis contains minor grammatical errors, such as missing verbs in sentences or unclear sentence structures that make reading difficult. Additionally, there are typographical errors and insufficient punctuation in the text, which reduce the overall clarity of the text.

Questions and comments to student:

1. What is the composition of free fatty acids in healthy stratum corneum? Is the structure of oleic acid correct and relevant for the stratum corneum?

2. What is the amount of water in healthy skin and in the different layers of the epidermis? How much water is associated with barrier lipids in a healthy skin barrier?

3. What specific amino acids make up natural moisturizing factors (NMF), and from which substrate do lactate and sugars, which are part of NMF, originate?

4. Did you participate in the isolation and purification of the barrier lipids used in your experiment? How were they obtained from biological material?

5. What number of samples (n) was evaluated using X-ray diffraction and Raman spectroscopy?

6. How was the calculation performed to determine the amount of water per lipid in your samples, as shown in Figure 15 and Figure 16?

7. Is there another method to determine the amount of water in the samples you prepared?

The thesis by Omran Zamani Gerashi meets the requirements for this type of work, and therefore, I recommend it for defense.

Evaluation of the thesis: Excellent   **For the defense:**   **Recommend**

In Hradec Králové   6. září 2024   signature of the opponent