

Master's Thesis Assessment

Reviewer's Report by Professor Vladimir Kral, PhD, DSc.

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**Studium difuze alaptidu z nanovláknenných
Vrstev**

**Study of diffusion of alaptide from
nanofibrous layers**

Study programme: N3106 – Textile Engineering

Study branch: 3106T018 – Nonwoven and Nanomaterials

Author: **Bc. Nikifor Asatiani**

Supervisor: Ing. Petr Mikeš, Ph.D.

Comments:

The topic of this Master Thesis is quite relevant to the key question defined by WHO for resistant bacterial elimination and chronical wound healing treatment with understanding of mechanism of action and developing of enabling technology for product development
With relevant application potential application

Student started his work with a very detailed and high quality theoretical review. He used many quality sources, especially in form of actual researches and scientific papers what is not typical for master's degree students.

Formal level of the work is also very good.

Relevance of MSc thesis topic:

Application of bioactive peptides for wound healing is hot topic of current medicine and pharma industry, specifically for resistant bacteria. In addition, mechanism of action and control release is open question in be addressed.

Results, significance of research

Nowadays there is a great demand in a searching of new methods of drug delivery, which involves modification of existing methods and as well as development of new devices. Increasing amount of controlled-release systems have been developed and designed lately to enhance drug therapy. A controlled-delivery system allows reducing the frequency of dosing, to minimize the fluctuation of drug concentration in plasma and to generally increase effectiveness of the drug by a) targeting the site of action, b) maintaining drug level within a desired range, i.e. high enough to have a therapeutic effect and low enough to be non-toxic

There is a lack of studies related to drug release kinetics from electrospun fibrous structures nowadays. Indeed, even less studies try to verify to compare experimental data with mathematic models. This study investigated the effects of drug loading and sterilization technics on release kinetics of alaptide from polycaprolactone (PCL)

electrospun nanofibrous layers. With the increasing drug loading increased hydrophilicity of the layers and decreased the fiber diameters. The release of alaptide was quantified using GPC. All the release profiles were found to be biphasic, consisting of significant initial burst release and further slow sustained release. The release kinetics were significantly dependent on the initial drug loading, sterilization with EtO did not remarkably affect the release. Fitting of data into mathematical models was complicated due to biphasic character of the release profiles. The study demonstrated successful fabrication of drug-loaded nanofibrous layers, which were able to provide sustained release of alaptide at least for 14 days.

Poly- ϵ -caprolactone (PCL) is linear hydrophobic aliphatic semi-crystalline polymer synthesized by ring-opening polymerization of ϵ -caprolacton
Nowadays, with increasing development of electrospinning
Technique, PCL has been getting great attention in healthcare field and tissue engineering
Due to its desirable characteristics
Alaptide was used mainly for its results in dermatological experiments: number of tests showed an ability of alaptide to positively influence epidermal regeneration. In vivo experiments were performed on domestic pigs, rats and mice, proved that alaptide accelerate skin regeneration and curing of experimental skin injuries. Moreover, very low acute toxicity was observed in rats and mice, i.e. 1g/1 kg dose caused only 20% mortality of female rats. Alaptide is now successfully used as veterinary ointment ALAPTID® (Bioveta, Czech Republic) for treatment of warm-blooded animals in order to cure local injuries as burns, frost-bites, bedsores, etc.

Analytical part starts with a short introduction and explanation of author's plans.
I am more than satisfied with the strategic analysis current literature, which is very detailed.
I miss some typical characteristics of projects, particularly PSD analysis in each step and impurity profile analysis

Questions for the defence:

Why did you choose just Customer service department for your analysis?

Please indicate PSD of used alaptide

How was finl nanofibers containing alaptide characterized.

Rationalle for polymer selection

Chemical impurity profile after nanofiber formation

Was racemization observed during epectrospinning process

PSD of alaptide

Factor for getting maximal loading capacity

Solid solution or solid dispersion was identified.as results

Description of homogenitz profile of materiál

Influence of SDS, mechanism of action

Localization of alaptide, surface, or inside nanofibes.

Conclusion:

- 1 Thesis Topic Novelty, Innovation potential 10
- 2 Meeting Thesis Objectives 10
- 3 Theoretical Background 10
- 4 Practical Application (Analysis) 9
- 5 Practical Application (Solution) 8
- 6 Formal Level 10

TOTAL evaluation: Excellent

Prague, May 29th, 2018

A handwritten signature in blue ink, appearing to be 'V. Král', is written over a faint, circular official stamp.

Prof. Dr. Vladimír Král, DSc