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Evaluation of PhD thesis of
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Preparation and surface modification of magnetic PLGA nanoparticles for sustaining natural interferon release

Subject

Nanomaterials are of great promise for use in drug delivery, as image contrast agents, and for diagnostic purposes. Nanoscale objects in the form of capsules, liposomes, and particles are widely used for delivering small-molecular-weight drugs and macromolecular-protein drugs by localized or targeted delivery to the tissue of interest. Polymeric nanoparticles show huge potential for controlled drug release and targeting ability in medical and pharmaceutical application. In addition to sustained release and targeting possibility the protection of sensitive drug molecules such as peptides are among the main advantages of modern drug carriers.

Relating the subject of the present research, the investigation of the relevant experimental parameters affecting the successful preparation of drug delivery nanoparticles is in the front of interest. The author's contribution to this field is important, which is supported by the papers published in international journals. The experimental design which is applied here in a professional mood is a powerful technique to treat several parameters simultaneously and determine their relative importance in a certain process. Two functional properties of the prepared drug delivery system – the size and the encapsulation efficiency – were selected to be optimized independently.

General evaluation

The form of the Thesis corresponds to the generally accepted structure with clear chain of ideas and definite description of the aim of the research. The *Introduction* with critical *Review* of previous works is followed by *Experimental part, Results and Discussion,* as well as *Conclusions*.The demonstration of the subject and the own experiments are sufficiently detailed and appropriate with suitable Figures and Tables. The results in generally are presented in a proper way. (Especially the Pareto charts are informative.)

The *New Scientific Results* of the research work are summarized in 5 thesis points in a rather concise way. It is reasonable in most cases. In the case of point 4 however, the present form is so general, that it does not contain new results.

I accept the thesis points as new scientific results except the thesis number 4. (For that I suggest to include the results obtained for and statements related to the systems studied by the author.)

Remarks and comments

I have some comments relating the introduction of the subject, the experiments and their evaluation.

1. p. 19 "In a physiological medium, extremely hydrophilic macromolecules like dextran or poly(ethylene glycol) (PEG) are often used to stabilize colloidal particles, since they interact strongly with the particle surface, and that they cannot form 'bridges' between different particles." I argue that statement, there are examples for bridging flocculation by PEO polymers, since that phenomenon is dependent on the surface coverage of the particles by the adsorbing polymer as well as on the molecular weight but not on the type of polymers.

2. The *encapsulation efficiency* is a central question. Application of a direct method to determine the drug content is more convincing in my opinion.

3. The *coencapsulation* of the magnetic nanoparticle and the bioactive component is also a crucial achievement. It would have been nice to see the experimental evidences collected that the two types of particles are present together in the PLGA carriers.

4. p. 60. There is a good example to show what the benefit of the experimental design is to explain the common effect of PLGA and HSA concentrations.

5. On the surface modification of the PLGA particles by Pluronic 68

Since the surface of the PLGA nanoparticles might contain a certain amount of PVA the evaluation of the composition of surface layer and its influence on physico-chemical properties is not easy following the Pluronic adsorption. This can lead to surprising and sometimes confusing experimental findings. The discussion of these data is moderate and appropriate in the thesis work.

6. Particle size distribution curves in Figure 23 present a wide size distribution which does not allow us to exclude the possible aggregation.

Questions

1. What can be the role of position of shear plane in the interpretation and comparison of measured zeta potential data?

2. How do you see the possible future application of the drug delivery system developed?

Final evaluation

The above remarks do not infer the high quality of the research work presented in the thesis work. The candidate performed a valuable research. The new scientific results are presented in papers appeared in international journals with high relevance. I suggest the acceptance of the Thesis for earning the PhD degree.

Prof. Dr. Kiss Éva