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Recommendation

for the submitted doctoral thesis of

Debjita Mukherjee

with the title

Microfluidics-assisted High-throughput Cell Encapsulation for Microtissue Engineering: from Cancer Models to Artificial Pancreatic Islets

3D-cell cultures and microtissues are receiving increasing interest in biomedical research, disease modelling and drug development among other fields. Techniques to prepare microtissues reproduceable and efficiently are demanded. Droplet microfluidic-based technologies are valuable and versatile tool to facilitate the preparation of cell spheroids. In this context, the thesis of Debjita Mukherjee is focusing on the investigation of droplet microfluidic systems to produce of cell-laden hydrogel based microdroplets and their application as cell models and drug testing.

The doctoral thesis Debjita Mukherjee of is divided into two parts and 7 chapters. Parts A is describing the “High-throughput Encapsulation System Development” and Part B “Application in Cancer Models and Artificial Pancreatic Islets”. Chapter 1 is reporting the investigated microfluidic droplet generation for cell encapsulation. Chapter 2 is dealing with crosslinking optimization, followed by hydrogel optimizations in Chapter 3. Chapter 4 extends the concept by creating droplets in droplets. Part B starts in Chapter 5 with the development of 3D cancer cell models in the microdroplet prepared with methods from part A. In chapter 6 the encapsulation of β -cell and the treatment option for type 1 Diabetes is investigated. Chapter 7 rounds up the thesis with a study using the encapsulation of artificial pancreatic islets with the use of microfluidics.

The studies presented in this thesis are new and original and the thesis demonstrates the candidate's knowledge in this area and the ability to undertake independent work, and that the work presented in the thesis is her own (it conforms to the guidelines specified in article 187 of the act of July 20th, 2018, as required).

The work was written in English. The text is written very fluently and linguistically on a high level. Every chapter has an extended theoretical part to guide the reader to the topic that is studied. These theoretical parts were rendered correctly and in a sound manner by Debjita Mukherjee. The methodic part and the results are comprehensive and well structured. If I could offer one criticism, it would be that the long discussion sessions could focus more on the relationship with the cited literature.

With his work, Debjita Mukherjee provided important and comparative statements on the topic of microtissues preparation within microdroplets and application of the derived cell models. The entire topic that the candidate dealt with was extensive and demanding. The work was done very purposefully and well thought out. Each chapter builds on one another very logically. The development on the microfluidic systems, procedures and the knowledge generated showed a very good picture of a self-contained and comprehensive topic. The results are very well prepared and clearly presented. The work is very well documented and has a high quality. I assume that parts of this work will be published soon.

I have examined various Ph.D. theses over the years and in my opinion this work stands out in the complexity and the different topics of engineering and cell biology. I recommend the acceptance of this doctoral thesis and the candidate should be awarded a with a Ph.D.

Yours sincerely,

Assoc. Prof. Dr. Torsten Mayr

	Unterzeichner	Torsten Erwin Mayr
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Hinweis	Dieses mit einer qualifizierten elektronischen Signatur versehene Dokument hat gemäß Art. 25 Abs. 2 der Verordnung (EU) Nr. 910/2014 vom 23. Juli 2014 ("eIDAS-V0") die gleiche Rechtswirkung wie ein handschriftlich unterschriebenes Dokument.	