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Annex No. 10 to the MU Directive on Habilitation Procedures and Professor Appointment Procedures

HABILITATION THESIS REVIEWER'S REPORT

Masaryk University	
Applicant	Mgr. Tomáš Bárta, Ph.D.
Habilitation thesis	Utilizing Retinal Organoids to Understand the Development, Function, and Diseases of the Human Retina
Reviewer	Prof. David Staněk, Ph.D.
Reviewer's home unit, institution	Institute of Molecular Genetics of the Czech Academy of Sciences

In his habilitation thesis entitled "*Utilizing Retinal Organoids to Understand the Development, Function, and Diseases of the Human Retina,*" Dr. Tomáš Bárta presents how the development of protocols for the *in vitro* generation of retinal organoids has significantly advanced retina-focused research. He begins with a concise and well-structured introduction to the development, anatomy, and physiology of the human retina, including the roles of individual retina-specific cell types.

He then shifts focus to retinal organoids, highlighting their ability to recapitulate retinal development and encompass all major retinal cell types—except for the retinal pigment epithelium. Particularly informative is the section discussing the application of retinal organoids in the study of various retinal dystrophies. Dr. Bárta also critically addresses the current limitations of organoid technology, notably the heterogeneity among organoids and the absence of retinal pigment epithelium.

In the second part of the habilitation thesis, Dr. Bárta outlines his own contributions to the field of retinal research and the application of retinal organoids. He primarily focuses on the expression of microRNAs (miRNAs) in retinal organoids. In a seminal study, he demonstrated that specific miRNAs play crucial roles in retinal development by fine-tuning the expression of *PAX6*, a key regulator of eye development. Furthermore, in a unique and original study, he explored how different wavelengths of light induce specific miRNAs, thereby influencing the regulation of circadian rhythms. Finally, he showed how retinal organoid technology can be integrated with mouse models to investigate the function of retina-specific proteins, such as TMEM107.

In summary, Dr. Tomáš Bárta has been a pioneer in the development and application of retinal organoid technology in the Czech Republic. His work stands out for its originality, depth, and methodological rigor, and he has made several important and widely recognized contributions to the field. Through his efforts, retinal organoids have become an established and powerful model system. His studies on the role of miRNAs, the impact of light on retinal gene regulation, and the use of organoids to dissect the function of retina-specific proteins reflect a high level

of scientific creativity and technical mastery. Thanks to his leadership and sustained contributions, retinal research in the Czech Republic has gained international visibility and competitiveness, placing Czech scientists at the forefront of retina research in Europe.

Reviewer's questions for the habilitation thesis defence (number of questions up to the reviewer)

Do you think that in the near future (~5 years) we will be able to evaluate the light sensing ability of retinal organoids as a routine test to monitor the phenotypes of various inherited retinal dystrophies?

Conclusion

The habilitation thesis entitled Utilizing Retinal Organoids to Understand the Development, Function, and Diseases of the Human Retina by Mgr. Tomáš Bárta, Ph.D. **fulfils** requirements expected of a habilitation thesis in the field of Anatomy, histology and embryology.

Date: 14th April 2025 Signature: