

# **Evaluation of research and professional activity of research-oriented institutes of the Czech Academy of Sciences for the period 2015–2019**

## **Summary Final Report**

**Name of the Institute: Institute of Experimental Medicine of the CAS, v. v. i.**

**Evaluated teams and their leaders:**

1. Department of Auditory Neuroscience (Rostislav Tureček)
3. Department of Cellular Neurophysiology (Miroslava Anděrová)
4. Department of Developmental Biology (Ondřej Machoň)
5. Department of Functional Organization of Biomembranes (Jan Malínský)
6. Department of Genetic Toxicology and Nanotoxicology (Jan Topinka)
7. Department of Molecular Biology of Cancer (Pavel Vodička)
8. Department of Neuroregeneration (Pavla Jendelová)
9. Department of Tissue Engineering (Eva Filová)
10. Department of Transplantation Immunology (Alena Zajícová)

## Part A: Evaluation of the institute

The commission was fascinated by the global picture drawn by the leaders and the representatives of the institute. The presentations were well organized and informative. The discussions helped to understand the details of the changes accomplished during the last years. The general concept of the scientific leadership fits the mainstream of the competitive research. Most of the departmental (group) leaders are internationally recognized scientists, there is a healthy balance between the senior and young team leaders. The Institute's policy is clear and transparent: It aims at joining international projects, increasing funding from extramural sources and establishing a long-term sustainability of their research activity. They seek domestic and international collaborations with strong partners. The Institute plays an active role in the training of young scientists, the number of post-doctoral fellows and PhD students is in the satisfactory range.

### Strengths:

After its re-organization, the management of the institute is dynamic; the objectives are clear, and the management purposefully coordinates the various components of the scientific work. Although the scientific activity of the institute is heterogeneous, it is of a high standard overall: number and quality of outputs has increased significantly in the last five years. High and successful activity of the Departments towards translation of the results (patents, licenses).

### Weaknesses:

There are still too many and heterogeneous research areas and the Departments cannot concentrate their efforts towards real breakthrough discoveries. The funding is short term in general which creates constant uncertainties among the scientists. Very few international (EU) research grants. No leading role in collaborations of international consortia. Lack of appropriate animal housing facilities.

### Opportunities:

Most of the research projects are in the mainstream of international interest and many of them have great translational potential. The age structure of the institute has been developing favourably and there are significant perspectives for researchers.

### Threats:

The lack of long- (or mid-) term financing structure and tenure carrier paths limit the selection of devoted scientists. The heterogeneity of its research program might affect the competitiveness of the Institute.

## Main criterion: 1. Quality of results (H1.1-H1.5)

<b>H1.1</b>	<b>Quality of selected outputs of Phase I</b>
The quality of selected outputs of Phase I is in large part very good, with a few excellent publications.	
<b>H1.2</b>	<b>Contribution of workers on the outputs reached</b>
The commission appreciates the publication strategy of IEM to publish in excellent, highly cited journals. Most of these excellent papers resulted from collaborations with international partners, where scientists of IEM provided essential data or methods, but were not in the lead of the collaboration. The commission believes that some groups of IEM are now in a position to aim at top-journal publications with IEM in the lead.	

<b>H1.3</b>	<b>Quality of all outputs and results</b>
<p>The quality of all outputs is in large part very good, with a few excellent publications. In part, there were large differences between groups e.g. between team 4 and 5. The number of all publications of the institute (440) has almost doubled since 2016, and the average impact factor is approximately 5. More than 200 papers were in foreign collaborations, indicating the international visibility of the Institute. Several outputs were published in highly respected journals such as in Science, Nature Reviews Neuroscience, PLoS Biology, Nature Communications, Biological Reviews.</p>	
<b>H1.4</b>	<b>The most valuable discoveries and findings in the fields, their importance for the field</b>
<ul style="list-style-type: none"> <li>• Department 1 has demonstrated an essential regulatory role of transcription factors in the early developmental stages of development of the cochlea.</li> <li>• In brain tissue derived from an animal model of focal cerebral ischemia, Department 3 identified sonic hedgehog (Shh) as an important factor that influences the differentiation of NG2 cells into astrocytes in vitro.</li> <li>• Department 6 has successfully investigated the toxic effects of various nanoparticles and has shown that long-term exposure to nanoparticles affects the DNA methylation profile.</li> <li>• Department 7 described a concept of non-invasive liquid biopsy, where biomarkers for various types of cancer such as colorectal, pancreatic, ovarian and breast cancer are being detected in the urine and stools of the patients.</li> <li>• Department 8 confirmed that induced pluripotent stem cells (iPS-NPs) are probably the most suitable candidate for the treatment of spinal cord injury (SCI) due to their robust survival, tissue sparing, reduction of glial scarring, and increased axonal sprouting.</li> <li>• Researchers from the Department 9 have developed novel technologies to produce nanofibers.</li> </ul>	
<b>H1.5</b>	<b>Contribution of the participation of the authors in large collaborations</b>
Not applicable here.	

## Main criterion: 2. Societal relevance (H2.1-H2.5)

<b>H2.1</b>	<b>Societal relevance of outputs and results pursuant to CAS and institute mission</b>
<p>The commission considers the societal relevance of research at IEM very high. The institute investigates health problems, focusing on four main research fields in biomedicine with a high potential for novel treatments: neuroscience, carcinogenesis, tissue regeneration and nanotoxicology. Here, it addresses health problems associated with aging of the human population and the impact of human activities on the environment. Therefore, the outputs are highly relevant pursuant to the mission of CAS and the Institute.</p>	
<b>H2.2</b>	<b>System functionality for knowledge transfer into practise, its usefulness for society. The impact of the institute's activity on proper practice in society in the area of social sciences and humanities</b>
<p>The usefulness of the biomedical results of the Institute for society is high, whereas it is limited for the area of social sciences and humanities. The IEM actively participated in contractual research with national and foreign companies from Germany, France and UK. In technology transfer, the major partner of IEM was the Biolnova biotechnology company.</p>	

<b>H2.3</b>	<b>Relation to practice</b>
<p>IEM has been very active and successful in transfer of results into practice. Numerous patents and utility patterns were applied for in the evaluation period, and a few licenses to use the inventions were already issued.</p> <p>IEM has implemented a system of identification of research results with application potential. In 2016, the Department of project support and technology transfer was founded within the organizational structure of the Institute. This department manages IP rights processes and license agreements.</p>	
<b>H2.4</b>	<b>Participation in AV21 strategy</b>
<p>Within the AV21 strategy, the Institute takes part in the research program Wellbeing in Health and Disease (QUALITAS). Here, IEM designs an in-vitro model of the blood-brain barrier. Furthermore, IEM studies the effects of air pollutants on DNA methylation in newborns from different districts of the Czech Republic (CR).</p>	
<b>H2.5</b>	<b>Cooperation with regions of the Czech Republic</b>
<p>IEM is strongly involved in cooperation with regions of the Czech Republic, based on common scientific projects with regional universities such as the Faculty of Medicine in Hradec Kralove, with the Medical Faculty and Biomedical Center in Pilsen (Western Bohemia), the University of Ostrava, and the University of Southern Bohemia.</p> <p>Another important regional collaboration framed is Healthy Aging in the Industrial Environment (HAIE). The project connects teams of the University of Ostrava and University of Southern Bohemia with the scientists at IEM. The main goal of the project is to clarify the impact of environmental risk factors and lifestyle upon the health and aging of the population in an industrial region (Moravian-Silesian Region) and outside this region (South Bohemian Region and Prague).</p>	

#### Further criterion: 1. Position in international and national context (D1.1-D1.3)

<b>D1.1</b>	<b>Comparison of the teams and the institute with similar international and national institutes</b>
<p>IEM is among the leading institutes with a similar scope in the Czech Republic. In the international context, the Institute is very visible and recognized, but should intensify its efforts to play a leading role.</p>	
<b>D1.2</b>	<b>Scope and quality of international and national cooperation and the role of the institute in such cooperation; engagement in broad international cooperation</b>
<p>The Institute very successfully cooperates with scientists from Czech universities. Here, IEM is frequently in a leading role (corresponding author of publications). Cooperation with clinical researchers from domestic universities is particularly important for the translation of pre-clinical results, the Institute should enhance such cooperation.</p> <p>According to the report of the Institute, scientists at IEM cooperate with 52 research teams from foreign universities or research institutes abroad. The international collaborators come from 15 European countries, the USA, Israel, Japan and Taiwan. Approximately half of all publications (214) were based on cooperation with groups from abroad. A large part of these publications was in the very good/excellent category. However, in these projects IEM was rarely in the lead. Also, it should be noted that the international cooperation rarely led to research grants (EU).</p>	

<b>D1.3</b>	<b>Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)</b>
See also the report of the individual teams. Members of the Institute organized or co-organized 15 national or international conferences. No information was given by the Institute as to invited lectures and scientific awards. In the reports on the individual teams, some invited lectures and few awards were listed. This low number seems to indicate that the international activities of IEM are presently weak and should be enhanced.	

## Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

<b>D2.1</b>	<b>Direction in line with the perspective of the planned research directions</b>
According to its report, IEM investigates current problems of biomedicine with the potential for application in clinical medicine. The research is focused on four main topics: CNS injuries and neurodegeneration, cancerogenesis, the pathological impact of the environment and tissue regeneration. In general, these are problems associated with aging, and with the growing impact of human activities on the environment. This research program is convincing and is in line with the mission of the institute. However, the commission notes that the four areas are quite divers, and that there is little interaction between them. In the future, the institute needs to discuss whether its resources will suffice to support such a heterogenous research program.	
<b>D2.2</b>	<b>Assessment of the previous research objectives and their achievement</b>
The research plan that was developed and discussed in 2016 is in large part convincing, and most of its objectives were reached.	
<b>D2.3</b>	<b>Assessment of implementation of recommendations from past evaluation</b>
The Institute has carefully considered all recommendations from its previous evaluation and has implemented most of them. Most importantly, an International Advisory Board was established, and together with this Board the newly appointed director re-assessed the Institute's structure and research program. During this process, the Institute underwent a major structural reorganization. The commission is convinced that all changes made are for the better and recommends continuing the discussion of research topics with the IAB.	
<b>D2.4</b>	<b>Success in receiving grants</b>
The Institute was very successful in receiving research grants: more than 50% of its budget is from domestic sources such as the Czech Science foundation or the Czech Ministry of Education, Youth and Sports. However, the contribution of foreign grants (e.g. EU) to its budget is only 2%. Thus, the commission recommends that the Institute uses its numerous international collaborations to join consortia that apply for EU grants.	
<b>D2.5</b>	<b>Adequacy of instrumental equipment</b>
The instrumental equipment of the Institute appears adequate. In its report, the Institute proclaims the need for an own animal facility. The commission cannot comment on this need, because only few details were given to support the requirement.	
<b>D2.6</b>	<b>Effectiveness of management</b>
There has been a marked transformation in the leading positions of the institute, and a thorough re-assessment of IEM's structure. Young and ambitious PIs are in position. In this process and in the implementation of changes, the newly appointed scientific director showed strong leadership. Already 3 years after the changes in 2016, IEM shows a marked improvement of its scientific performance.	

<b>D2.7</b>	<b>Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth</b>
	IEM is constantly trying to recruit new, capable employees by conventional, active search processes. Furthermore, the Institute reports that it is successful in keeping the best scientists (postdocs) and also bachelor and master students for its PhD program. The age structure of the Institute appears balanced.
<b>D2.8</b>	<b>Creating work-life balance conditions, assessment of approach towards possible gender issues</b>
	IEM has been successful in creating optimal work-life balance conditions. The Institute has made a strong effort to increase the satisfaction of their employees with the working conditions. Most importantly, in addition to numerous benefits, conditions such as working hours, home office and leave regulations were made flexible.
<b>D2.9</b>	<b>Relation of the institute with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.</b>
	No information as to this point was given in the report or the presentation of the Institute.

### Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

<b>D3.1</b>	<b>Scope of cooperation with universities on national and international level</b>
	In addition to numerous collaborative research projects, IEM cooperates with Czech universities in the education of master, bachelor and PhD students. No cooperation with international universities in education was listed.
<b>D3.2</b>	<b>Effectiveness of joint research centres</b>
	During the evaluation period, IEM participated in five joint research centres with universities, namely the Project of excellence in the field of neuroscience (PEN), the Centre for Studies on Toxicity of nanoparticles (CENATOX), the Centre for Development of Original Drugs (CVOL), the Centre for Orofacial Development and Regeneration (GACR), and the Centre for Cell Therapy and Tissue Repair (RCCT). Currently, the Institute participates in two research centres (NEUROENCORN and HAIE). The commission considers these research centres a success but points out that there were only few interactions with clinical research. In the future, IEM needs to enhance these interactions and find ways to bridge the gap between experimental and clinical research.
<b>D3.3</b>	<b>Success rate in supervision of PhD students</b>
	In the evaluation period, 28 PhD students successfully defended their theses. Given the number of research groups (11) and scientists (approximately 70), this output could be increased.
<b>D3.4</b>	<b>Participation of PhD students in the outputs</b>
	PhD students are a main driving force advancing the research by the teams. PhD students participate in nearly all experiments as well as in the resulting publications. Thus, in the vast majority of papers, PhD students are co-authors, sometimes as first author. It is mandatory that PhD theses must be based on at least one publication with a student as first author and several others as co-authors.
<b>D3.5</b>	<b>Participation of the institute in master or bachelor studies</b>

The institute lists 41 master and 33 bachelor theses that were successfully defended in the evaluation period. Given the number of research groups (11) and senior scientists, this output could be increased.	
<b>D3.6</b>	<b>Assessment of cooperation intensity with universities in the form of teaching</b>
The Institute reports a strong involvement in teaching of bachelor, master and PhD studies in the form of semesterly lectures, seminars and courses. There appears to be no involvement in teaching the basic curricula.	

#### Further criterion: 4. Outreach activities (D4.1-D4.3)

<b>D4.1</b>	<b>Sufficiency of media strategy and activities in the area of research popularisation</b>
See also the report of the individual teams. IEM is intensely involved in outreach activities for popularization of science in the format of exhibitions and lecture series such as the Science and Technology Week, Brain Week and Science Fair. The events are addressed towards high school students and general public. In addition, they are also addressed towards undergraduate students as a means to recruit PhD students. These activities appear to be received very well by the addressees.	
<b>D4.2</b>	<b>Publishing activities and its quality</b>
The Institute reported no publications in the area of research popularization.	
<b>D4.3</b>	<b>Participation in professional organisations in the area of research and development</b>
Only limited information as to this query was presented by the Institute. Senior scientists of the Institute are active members in scientific associations, serve on editorial boards of scientific journals, and are members of scientific councils.	

**Other comments of the commission:**

## Part B: Evaluation of teams

### 1. Department of Auditory Neuroscience

The long-term goal of research at the Department of Auditory Neuroscience is to elucidate the structural and functional properties of the mammalian auditory system, with a particular interest in how changes in these properties are involved in the pathogenesis of conditions such as sensory neural hearing loss, tinnitus or presbycusis. The projects carried out at the department during the evaluated period were mostly focused on internal and external factors which influence the development and aging of hearing function. The different groups in the department resort to a large array of methodological approaches: electrophysiology, immunohistochemistry, imaging, biochemical methods and behavioural tests.

#### Strengths:

The department has a clearly defined research topic that is common to all its researchers. Their research activity fits the mainstream of experimental neuroscience. They have a great variety of investigating methods. The Department carries out focused projects in the field of auditory physiology. The department has a well-recognised expertise. The department is engaged in productive national and international collaborations. Team members also cooperate closely with clinical facilities.

#### Weaknesses:

Despite the increasing number of scientists in the group, the number of PhD student seems to be decreasing in the past years.

Most of the high impact publication are issued from large collaboration and only few team members seem to be involved.

#### Opportunities:

Clear common questions could lead to better publications based on different approaches in a single paper. Team member should apply for international (EU) grants.

#### Threats:

Too many independent projects. Risk of losing funding.

### Main criterion: 1. Quality of results (H1.1-H1.5)

<b>H1.1</b>	<b>Quality of selected outputs of Phase I</b>
The quality of the 10 selected outputs of Phase I is mostly very good, in part excellent. The results have predominately been published in high-quality international journals; 9/10 in the top 50% of journals (quartile 1 and 2), 5 of these in excellent journals (decile 1). Citation frequency of the outputs is good.	
<b>H1.2</b>	<b>Contribution of workers on the outputs reached</b>
In publications resulting from national and/or international collaborations, members of the team were frequently leading, and/or provided essential and important contributions.	
<b>H1.3</b>	<b>Quality of all outputs and results</b>
The results of the evaluated department were mostly very good, in part excellent. In the majority of the collaborations, the group was the leading partner. The 38 articles have been published in peer-reviewed international journals, 6 in high-quality journals (first quartile)	



and 13 in second quartile journals. Five outputs were published in excellent journals (decile 1).	
<b>H1.4</b>	<b>The most valuable discoveries and findings in the fields, their importance for the field</b>
<p>The group has demonstrated an essential regulatory role of transcription factors in the early developmental stages of development of the cochlea.</p> <p>Dysfunctional axonal trafficking of GABAB receptor in Alzheimer's disease increases A<math>\beta</math> formation.</p> <p>Brief noise exposure during the critical period of postnatal development altered the development of hearing abilities in young animals and resulted in anomalous processing of acoustic stimuli in the adult auditory system. Functional changes were accompanied by the altered morphology of central auditory structures. Significantly decreased numbers of inner hair cell ribbon synapses and an abnormal morphology of principal neurons in the inferior colliculus, medial geniculate body and auditory cortex. Short exposure to noise also led to changes in sound-evoked behavioural responses of adult rats, indicating anomalies in intensity coding and volume perception.</p> <p>The department technically contributed to the development of new genetically encoded, fluorescent dyes that can be used as Ca<sup>2+</sup> or voltage sensors for in vivo imaging of neuronal activity in the mouse auditory cortex.</p>	
<b>H1.5</b>	<b>Contribution of the participation of the authors in large collaborations</b>
Not applicable here.	

## Main criterion: 2. Societal relevance (H2.1-H2.5)

<b>H2.1</b>	<b>Societal relevance of outputs and results pursuant to CAS and institute mission</b>
The social relevance of research on the pathophysiology of tinnitus and on age-related alterations of auditory function is very high.	
<b>H2.2</b>	<b>System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team's activity on proper practice in society in the area of social sciences and humanities</b>
Knowledge transfer of team's results is of high importance for diagnosis of hearing loss and tinnitus. The impact of the team's activity on society in the area of social sciences and humanities is limited.	
<b>H2.3</b>	<b>Relation to practice</b>
Team members cooperate with clinical facilities. However, based on the information in the report, the commission concludes that the translational projects and interactions with the clinicians could be enhanced.	
<b>H2.4</b>	<b>Participation in AV21 strategy</b>
No information was provided by the Department in its report and presentation.	
<b>H2.5</b>	<b>Cooperation with regions of the Czech Republic</b>

The team cooperates and shares grants with several Czech institutes that can provide relevant contributions to its research program.

### Further criterion: 1. Position in international and national context (D1.1-D1.3)

<b>D1.1</b>	<b>Comparison of the team with similar international and national institutes</b>
Despite the huge competition within the field of auditory neuroscience, the Department masters appropriate and modern technologies. It is the leading research group among those with similar aims and scope. In the international context, it is highly visible and recognized.	
<b>D1.2</b>	<b>Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation</b>
The department is engaged in several international collaborations. Its report lists 3 collaborations with international groups: The Department of Biomedicine, University of Basel, Switzerland (4 papers); Taiwan University (2 papers), Medel company, Innsbruck, Austria (1 paper). The role of the department in these cooperations is sometimes hard to define. Only few team members co-signed top ranked publications. The contribution of the team in international collaborations seems predominantly methodologic.	
<b>D1.3</b>	<b>Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)</b>
<p>The Department has co-organized 6 workshops entitled Training Schools in Auditory Neurobiology, Auditory Neuroscience Methods or Neurobiology of Hearing for foreign European and US students. No information on the role of the team in this organization was given.</p> <p>Josef Syka and Jiri Popelar had been invited for lectures abroad (Italy, Malta)</p> <p>Josef Syka, former head of the department received the Silver Medal of the Senate of the Parliament of the Czech Republic (2015), the Gold Medal of the Charles University (2015), and the Honorary Medal “De Scientia et Humanitate Optime Meritis” from the President of the Academy of Sciences of the Czech Republic (2015)</p>	

### Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

<b>D2.1</b>	<b>Direction in line with the perspective of the planned research directions</b>
The perspective was in line with their original plan and created a professional stability for the researchers.	
<b>D2.2</b>	<b>Assessment of the previous research objectives and their achievement</b>
<p>Their achievements are more than remarkable since they have published important results in prestigious journals.</p> <p>Beyond the plan, they studied the molecular mechanisms of the modulation of inhibitory GABAB receptors by KCTD proteins. They successfully established the breeding of KCTD12<sup>-/-</sup> and KCTD16<sup>-/-</sup> mice and began characterizing their auditory phenotype.</p>	
<b>D2.3</b>	<b>Assessment of implementation of recommendations from past evaluation</b>

The report of the team describes a convincing consideration and implementation of the recommendations from the past evaluation.	
<b>D2.4</b>	<b>Success in receiving grants</b>
The commission considers the funding of the team through grants as very good. The team received grants covering more than 50% of their budget, among them 11 grants from the Czech Research Council and 2 EU grants. This is an excellent performance.	
<b>D2.5</b>	<b>Adequacy of instrumental equipment</b>
The commission concludes that the instrumental equipment of the team appears very good.	
<b>D2.6</b>	<b>Effectiveness of management</b>
It is hard to evaluate that criterion. It seems that the group is discussing and proposing new action plans in coordination with the HR group at the IEM. The group leader seems to be involved and strives to optimize his management and the structure of the team.	
<b>D2.7</b>	<b>Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth</b>
The commission considers the strategies for recruitment and helping students and scientists careers convincing. The age structure of the team is balanced. An effort should be nevertheless made to recruit excellent PhD students.	
<b>D2.8</b>	<b>Creating work-life balance conditions, assessment of approach towards possible gender issues</b>
There were no specific measures for work-life balance conditions and possible gender issues described by the team.	
<b>D2.9</b>	<b>Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.</b>
No information as to this criterion was provided by the Department.	

### Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

<b>D3.1</b>	<b>Scope of cooperation with universities on national and international level</b>
The department cooperates with Czech Universities in all the three levels of graduate and postgraduate education and qualification (Bachelor, Master, and PhD studies). Members of the Department gave numerous lectures, seminars and courses for graduate students. No information as to their involvement in teaching the basic curriculum was provided.	
<b>D3.2</b>	<b>Effectiveness of joint research centres</b>
<p>The department participated in a large joint grant project “Project of excellence in the field of neuroscience” funded by the Czech Science Foundation. The research consortium included The Institute of Physiology, CAS, and the 2nd Medical Faculty, Charles University. The department contributed by 6 papers published in international journals.</p> <p>The department participated in “BIOCEV”, a joint project of six institutes of the Academy of Sciences of the Czech Republic and two faculties of Charles University in Prague. A small research team from the Department took part in the “Functional Genomics” program and</p>	

was responsible for the Research Project titled “Auditory Function in Mutant Mice”. The collaboration led to 10 the publications.	
<b>D3.3</b>	<b>Success rate in supervision of PhD students</b>
During the evaluated period 3 PhD students successfully defended their thesis. For such a large research group this number should be increased in order to maintain a strong dynamic.	
<b>D3.4</b>	<b>Participation of PhD students in the outputs</b>
PhD students participated in the scientific research and contributed to 5 publications as first authors and to 18 publications as co-authors. Students also helped during training courses, overseeing the practical demonstrations of methods used in the auditory research (In-vivo electrophysiology, immunohistochemistry, neuronal morphology, testing of behaviour).	
<b>D3.5</b>	<b>Participation of the team in master or bachelor studies</b>
Only 1 bachelor and 2 master students finished their thesis during the evaluated period. Increasing the number of master thesis supervised could help to recruit good PhD candidates.	
<b>D3.6</b>	<b>Assessment of cooperation intensity with universities in the form of teaching</b>
Involvement of senior group members in teaching bachelor or master students at the cooperating universities is marginal. This could be the reason for the low number of master students in the lab.	

#### Further criterion: 4. Outreach activities (D4.1-D4.3)

<b>D4.1</b>	<b>Sufficiency of media strategy and activities in the area of research popularisation</b>
Members of the department were involved in the following events organized by CAS for popularization of science, and gave lectures for the general public: Brain Awareness Week, 2017; Week of Science and Technology, 2017; Brain Awareness Week, 2018; Weak of Science and Technology, 2018; Brain Awareness Week, 2019; Week of Science and Technology, 2019; Science Fair, 2019.	
<b>D4.2</b>	<b>Publishing activities and its quality</b>
No information as to publications in the area of science popularization were given by the Department.	
<b>D4.3</b>	<b>Participation in professional organisations in the area of research and development</b>
The Department provided limited information as to this criterion. Prof. Josef Syka served on numerous committees of Charles University, as chairman of the Czech Neuroscience Society, and as editor or member of the editorial board of several journals. Dr. Rostislav Turecek is review editor for the journals Frontiers in Cell and Developmental Biology and Frontiers in Molecular Endocrinology.	

**Other comments of the commission:**

### 3. Department of Cellular Neurophysiology

Although it has a moderate size, the department represents a set of productive research groups. Their scientific activity focuses on membrane and morphological characteristics of glial cells after ischemic brain injury and on the progression of neurodegenerative diseases, especially of Alzheimer's disease. Their investigations involve the function of astrocytes, both at the level of gene expression and protein synthesis, as well as at the level of astrocytic functional properties of ion channels and receptors, which are necessary for maintaining the homeostasis of ions and neurotransmitters in the extracellular environment.

#### Strengths:

Their research activity fits the mainstream of experimental neuroscience. State-of-the-art methodology with suitable, very good mouse models of neurological diseases. The Department is well-funded. They attract many graduate and post-graduate students.

#### Weaknesses:

The limited timeframe of the grant-supports does not allow long-term investigations therefore the continuity of many projects remains uncertain. The department currently lacks experienced postdocs who could apply for their own grants, supervise students and coordinate projects. A considerable portion of the outputs of the department was published in average/below average quality journals.

#### Opportunities:

Joining with international projects (EU) would help to overcome the short-term financing problems and enhances the knowledge and technology transfer

#### Threats:

Too many parallel projects and lack of critical mass for handling the diverse methodological challenges. Risk of losing financing.

#### Main criterion: 1. Quality of results (H1.1-H1.5)

<b>H1.1</b>	<b>Quality of selected outputs of Phase I</b>
The quality of selected outputs of Phase I is good, in part very good. Three of 7 selected outputs were published in quartile 1 journals, 2 in quartile 2 journals. There is no excellent publication (paper in decile 1 journal) in the selected outputs.	
<b>H1.2</b>	<b>Contribution of workers on the outputs reached</b>
The publications resulted from local, national and/or a few international collaborations. Investigators of the Department are very often either first or corresponding authors indicating their essential and important contributions in the papers.	
<b>H1.3</b>	<b>Quality of all outputs and results</b>
The quality of all outputs is mainly good, a few are in the very good category: of 21 papers published between 2015 and 2019, 3 were published in quarter 1 journals, and 8 in quarter 2 journals. There was no excellent output (decile 1 journal), and about 50% of all papers remain in the average/below average category. However, some of the outputs received international interest (>5 citations/year).	
<b>H1.4</b>	<b>The most valuable discoveries and findings in the fields, their importance for the field</b>

According to the report of the Department, the most important during the last five years were as follows:

Members of the Department provided evidence that intracellular Na<sup>+</sup> dynamics can modulate astrocytic membrane conductance that controls mechanisms such as cell volume regulation. They strengthened the concept that limiting astrocyte intracellular Na<sup>+</sup> accumulation might be a favourable strategy to counteract the development of brain oedema. Furthermore, they provided a detailed picture of the gene expression of ionotropic (AMPA, kainate, NMDA) and the main metabotropic glutamate receptors in cortical glial cells isolated from GFAP/EGFP mice before and after focal cerebral ischemia. Their results may serve as the basis for further research on glial cell physiology and pathophysiology. Electrophysiological recordings of hippocampal astroglia cells revealed that a shortage of glucose specifically increases astrocyte membrane capacitance and astrocyte volume. It was shown that glucose deprivation decreases the astrocytic gap junction-mediated coupling and increases their intracellular calcium levels during the slow depression of synaptic transmission. Their data indicate that astrocytes rapidly respond to metabolic dysfunctions and are therefore central to the neuroglial dialog at play in brain adaptation to glucopenia.

In brain tissue derived from an animal model of focal cerebral ischemia, sonic hedgehog (Shh) was identified as an important factor that influences the differentiation of NG2 cells into astrocytes in vitro. Shh activation significantly increased the number of astrocytes derived from NG2 cells in the glial scar around the ischemic lesion, while Shh inhibition caused the opposite effect. Since modifications of Shh signalling did not change the proliferation rate of NG2 cells, it was concluded that Shh directly enhances the differentiation of NG2 cells and consequently affects the formation and composition of a glial scar. In addition, several aspects of glial cell pathophysiology were studied such as the protective role of extracellular matrix and changes in brain diffusion in aging and degenerative disorders. In studies of patients with Huntington's disease (HD), it was shown that there is a metalloprotein-bound iron accumulation in the globus pallidus. They extended their studies to animal models of HD and made significant observations. The researchers from the Department showed that the Wnt signalling pathway orchestrates neonatal NS/PCs differentiation towards cells with neuronal characteristics, which might be important for nervous tissue regeneration during central nervous system disorders.

<b>H1.5</b>	<b>Contribution of the participation of the authors in large collaborations</b>
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Not applicable here.

## Main criterion: 2. Societal relevance (H2.1-H2.5)

<b>H2.1</b>	<b>Societal relevance of outputs and results pursuant to CAS and institute mission</b>
Cerebrovascular diseases represent a great burden on the society. Despite strong research efforts, stroke and stroke related disabilities remain an unresolved health problem. Therefore, a better understanding of the mechanisms of cerebral and spinal oedema would be a great achievement for the further steps in finding new therapeutical means. The role of glia cells in the pathophysiology of the nervous system needs further systemic investigations. Therefore, the work by the Department is timely and very important.	
<b>H2.2</b>	<b>System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team's activity on proper practice in society in the area of social sciences and humanities</b>

The ageing society faces a great variety of neurological disease. The research and knowledge obtained by the Department has a great transitional potential and value.	
<b>H2.3</b>	<b>Relation to practice</b>
Without well-designed and well-conducted in vitro and in vivo experiments there is only a minor chance to figure out the fine mechanisms of acute and chronic neurological diseases. The research also enhances the knowledge-transfer for graduate- and post-graduate level.	
<b>H2.4</b>	<b>Participation in AV21 strategy</b>
No information as to this topic was provided in the report or the presentation of the Department.	
<b>H2.5</b>	<b>Cooperation with regions of the Czech Republic</b>
The Department cooperates with several institutes of the CAS and with the Charles University. The common work provides a relevant background for sharing various specialties and infrastructure.	

### Further criterion: 1. Position in international and national context (D1.1-D1.3)

<b>D1.1</b>	<b>Comparison of the team with similar international and national institutes</b>
There is a huge competition within the field of experimental neuroscience. The commission ranks the Department among the leading Czech research groups in this field. In the international context, the Department is recognized, but could enhance its visibility by stronger collaborations, international (EU) grants, and an improved publication strategy. The potential is clearly there, since the Department uses most of the advanced technology, and the results are absolutely convincing and meet the European standards. The commission notes that the limited size and infrastructure of the department affects its international competitiveness.	
<b>D1.2</b>	<b>Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation</b>
The team mainly cooperates with other groups from institutes of the Czech Academy of Sciences. Collaboration with these laboratories allows the use of methodological approaches which are not available in IEM. The international cooperation seems weaker at present and appears restricted to student exchange programs. In order to further improve the quality of the research, stronger international collaboration, grants and knowledge transfer are needed. The department should display its unique strengths and ideas at the international level.	
<b>D1.3</b>	<b>Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)</b>
<p>Miroslava Anderova (IEM) co-organized the workshop “Human stem cell derived astrocytes as a new platform for studying neurological disorders” in Prague 2017.</p> <p>Members of the Department gave numerous invited lectures at domestic and foreign research institutes.</p> <p>Helena Pivonkova received the Otto Wichterle Award of the Czech Academy of Sciences. Hana Bernhardova was awarded the prize for the best presentation at a conference of high school students within the project Open Science of the Czech Academy of Sciences.</p>	

## Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

<b>D2.1</b>	<b>Direction in line with the perspective of the planned research directions</b>
According to the results of the evaluation period, the research direction is in line with the initial plans. The department has proven the participation of NG2 glia in CNS regeneration following focal cerebral ischemia (FCI), namely in the formation/composition of a glial scar and a direct influence of morphogen Shh on NG2 glia differentiation towards reactive astrocytes. Their publication revealed that an identified distinct subpopulations of NG2 cells emerging after FCI and four subpopulations of oligodendrocytes, which reflected the process of their maturation. Their results suggest that, unlike in Alzheimer's-like pathology, NG2 cells only acquire a multipotent phenotype following FCI.	
<b>D2.2</b>	<b>Assessment of the previous research objectives and their achievement</b>
Most previous research objectives were reached. The Department improved its publication activity and moved from the descriptive analysis towards to the investigation of mechanisms of various pathologies. They initiated several collaborations within the period of 2015-2019 which resulted in publications.	
<b>D2.3</b>	<b>Assessment of implementation of recommendations from past evaluation</b>
The report of the team describes a detailed and convincing consideration and (in-part) implementation of the recommendations from the past evaluation.	
<b>D2.4</b>	<b>Success in receiving grants</b>
The department is very successful in receiving domestic grants. At present, there appears to be no international (EU) funding. The report states that financing of the ongoing research is stable for the following 2 years.	
<b>D2.5</b>	<b>Adequacy of instrumental equipment</b>
The laboratories appear equipped well and adequate for the research plan and methodology employed.	
<b>D2.6</b>	<b>Effectiveness of management</b>
The management appears successful since they can handle the requirements for the great variety of research projects which require strong control and coordination.	
<b>D2.7</b>	<b>Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth</b>
The age structure of the Department is far from the ideal. The good part is that there are young investigators, but the middle age generation is hardly represented. In the period of 2015-2019 the team comprised of three PIs (2.3 FTE), two postdocs (1.5FTE), seven PhD students, two undergraduate students and two technicians which indicates a stabilization period.	
<b>D2.8</b>	<b>Creating work-life balance conditions, assessment of approach towards possible gender issues</b>
The HR policy of the Department follows the relevant rules and documents of the CAS and IEM. It includes transparent recruitment and filling managerial positions, clear career principles, the principles and practice of equal treatment, evaluation and remuneration, as well as measures to balance personal and working life (e.g. part-time work, teleworking and home office, flexible working time).	



<b>D2.9</b>	<b>Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.</b>
<p>The Department participated in the “Project of excellence in the field of neuroscience”, which included several institutions from the CAS network, the Second Medical Faculty of Charles University, and the National Institute of Mental Health. The project aimed at elucidating the pathophysiological mechanisms underlying the development of neurodegenerative diseases, from the molecular up to the systemic level. The project created a network of high-level scientific teams and thus promoted an inter-disciplinary approach that would otherwise not be feasible based on the individual projects of any single associate. The project also provided a unique basis for PhD training in neuroscience.</p>	

### Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

<b>D3.1</b>	<b>Scope of cooperation with universities on national and international level</b>
<p>The Department cooperates with domestic universities in all the three levels of education and qualification (Bachelor, Master, and PhD studies). Members of the Department gave numerous lectures, seminars and courses for graduate students. No information as to their involvement in teaching the basic curriculum was provided. In the international context, the Department is now member of a MARIE Skłodowska-CURIE ACTIONS Innovative Training Networks (ITN) called Astrotech, which comprises 11 beneficiaries and 14 partners belonging to 9 European and Non-EU countries.</p>	
<b>D3.2</b>	<b>Effectiveness of joint research centres</b>
<p>They have got good experiences during the period evaluated but the opportunities have not been fully explored and used yet. This would be an important step in the future for stabilizing the research potential and effectiveness of the work.</p>	
<b>D3.3</b>	<b>Success rate in supervision of PhD students</b>
<p>The report lists 5 successful PhD defences in 5 years. This is a good activity which could be enhanced further. Of course, not only the number but also the quality of the theses counts but from a such productive Department a higher number of PhD degrees is desirable.</p>	
<b>D3.4</b>	<b>Participation of PhD students in the outputs</b>
<p>The participation of PhD students in the outputs of the Department is very good. PhD students are co-authors of many of the publications. In addition, in eight papers published in the evaluated period, PhD students are the first authors. Students were not only engaged in the experimental work, but also analysed their results and participated in writing the actual manuscript. Moreover, the students were quite successful in receiving grants from Charles University.</p>	
<b>D3.5</b>	<b>Participation of the team in master or bachelor studies</b>
<p>The Department is involved in the graduate education via multiple connections to Charles University. There are regular courses thought by the senior scientists. During the period evaluated 8 Bachelor and 8 Master theses were finished under the supervision of the Department.</p>	

<b>D3.6</b>	<b>Assessment of cooperation intensity with universities in the form of teaching</b>
The Department has been engaged in numerous teaching activities at different levels of the educational process. The number of lectures and seminars held at university courses is in harmony with the size of the Department. It would be timely to announce a course on methods of investigative neuroscience or on a similar theme complementing the university-privileged courses.	

#### Further criterion: 4. Outreach activities (D4.1-D4.3)

<b>D4.1</b>	<b>Sufficiency of media strategy and activities in the area of research popularisation</b>
The Department participated very actively in events aiming at popularization of science such as the IEM Open Day, the Science Fair of the Czech Academy of Sciences, the Week of the Brain of the Czech Academy of Sciences, the Market of the Science, and Open Science.	
<b>D4.2</b>	<b>Publishing activities and its quality</b>
No information on publications in the area of research popularization was given by the Department.	
<b>D4.3</b>	<b>Participation in professional organisations in the area of research and development</b>
The senior scientists are present in Commissions and Editorial boards of various Societies and Journals. They participate in the work of many professional organization. The head of the Department is the Director of the Institute and therefore she has direct effect on strategies of research development and institutional policy.	

**Other comments of the commission:**

## 4. Department of Developmental Biology

### Strengths:

Recently the group was able to participate in high quality publications. Good collaborations both national and international.

### Weaknesses:

Currently it is a small group with three researchers and two PhD students

### Opportunities:

Continuation of international collaborations. attracting more PhD students

### Threats:

Short term grants, having a small number of researchers increases the vulnerability.

### Main criterion: 1. Quality of results (H1.1-H1.5)

<b>H1.1</b>	<b>Quality of selected outputs of Phase I</b>
The average rating of the team is 2.1. The selected output of the Dept. of Developmental biology involved 7 scientific publications two in D1 journals, two in Q1-s, and three in Q2-s, respectively. The number of reprint authors is 1 out of 4 in the D1+Q1 papers, and the fractional count is below 0.3 in the top two categories.	
<b>H1.2</b>	<b>Contribution of workers on the outputs reached</b>
The evaluation period can be divided to two parts. The old Teratology Dept was replaced and renamed from 2018 to Developmental Biology. The leader of the Teratology Department was retired and the new leader brought with him his research topic. The researchers FTE in the teratology Dept was between 3.6-3.02, in the Dev. Biology Dept 4.03-3.50. The FTE of PhD students was from 1.82-1.29, now it is 2.91. It is concluded that many young people joined to the team.	
<b>H1.3</b>	<b>Quality of all outputs and results</b>
In phase I the group (No 42) had a total output of 19 articles with IF. The productivity of the team in the excellent category both considering the category 1/FTE and the category 1+2/FTE is less than the average of 62 groups.	
<b>H1.4</b>	<b>The most valuable discoveries and findings in the fields, their importance for the field</b>
<p>1. Transcription factors mediating the Wnt signaling pathway Tcf7L2 is essential for neurogenesis in the developing mouse neocortex. Neural Development (2018). Tcf7L2 is the principal Wnt mediator In the absence of Tcf7L2, the Wnt activity is reduced. 3/5 of the authors were from DDB IEM, including the first and corresponding authors.</p> <p>2. Modeling Edar expression reveals the hidden dynamics of tooth signaling center patterning PLoSBiology (2019) 17(2): e3000064, IF 8.386</p> <p>3. The role of Meis transcription factors in neural crest cells is studied on recently established zebrafish model and CRISPR/Cas9 technology for gene inactivation These three recent key studies represent the new direction of research of the Dept. (1,3) and the projects on tooth development (odontology) were further maintained (2).</p>	

<b>H1.5</b>	<b>Contribution of the participation of the authors in large collaborations</b>
Not applicable.	

## Main criterion: 2. Societal relevance (H2.1-H2.5)

<b>H2.1</b>	<b>Societal relevance of outputs and results pursuant to CAS and institute mission</b>
The research projects and their results presented are relevant to the society, suitable to create public interest.	
<b>H2.2</b>	<b>System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team's activity on proper practice in society in the area of social sciences and humanities</b>
Not applicable.	
<b>H2.3</b>	<b>Relation to practice</b>
The team's work is decisively basic science, but it can lay the foundations for future drug development or gene therapy.	
<b>H2.4</b>	<b>Participation in AV21 strategy</b>
Not applicable.	
<b>H2.5</b>	<b>Cooperation with regions of the Czech Republic</b>
None reported.	

## Further criterion: 1. Position in international and national context (D1.1-D1.3)

<b>D1.1</b>	<b>Comparison of the team with similar international and national institutes</b>
It is a newly formed team since 2018. The comparison is too early but encouraging progress has been achieved.	
<b>D1.2</b>	<b>Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation</b>
All of the team's paper are written in collaboration with other teams. 7/19 of the papers were written with national collaborators. 7/19 from international and 5/19 from large collaborations. In half of the papers the reprint author was a team member of the Dept. of Developmental Biology.	
<b>D1.3</b>	<b>Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)</b>
Ondrej Machon was an invited speaker on Visegrad Group Society for Developmental Biology: Inaugural Meeting. Sept 7, 2018.	

## Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

<b>D2.1</b>	<b>Direction in line with the perspective of the planned research directions</b>
The new leader of the team has a consistent, long-lasting scientific interest about the control of craniofacial and neural development, regulation of transcription which is now the mainstream research topic in the Department. Since 2019 the new projects were initiated and performed, successfully.	
<b>D2.2</b>	<b>Assessment of the previous research objectives and their achievement</b>
Teratology projects were discontinued with the retirement of the previous group leader, but projects on tooth development (odontology) were further maintained, successfully.	
<b>D2.3</b>	<b>Assessment of implementation of recommendations from past evaluation</b>
Not applicable, because the Department's structure was greatly altered.	
<b>D2.4</b>	<b>Success in receiving grants</b>
The team currently has only a few, short term grants.	
<b>D2.5</b>	<b>Adequacy of instrumental equipment</b>
The equipment and generally the infrastructure of the Institute is suitable to achieve the goals of the team.	
<b>D2.6</b>	<b>Effectiveness of management</b>
The head of the department is an efficient leader of the team.	
<b>D2.7</b>	<b>Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth</b>
The group size is too small to apply all of these categories, but the management of the team is working on the establishment of an efficient, professional team.	
<b>D2.8</b>	<b>Creating work-life balance conditions, assessment of approach towards possible gender issues</b>
Adequate working environment.	
<b>D2.9</b>	<b>Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.</b>
Not applicable.	

## Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

<b>D3.1</b>	<b>Scope of cooperation with universities on national and international level</b>
Team members participate both in the BSc and MSc programs as lecturer and practical teachers. They have important teaching activity.	
<b>D3.2</b>	<b>Effectiveness of joint research centres</b>
There was no participation in these types of centres.	

<b>D3.3</b>	<b>Success rate in supervision of PhD students</b>
During the 2015-19 period 1 PhD thesis was defended, five students got Master's degree.	
<b>D3.4</b>	<b>Participation of PhD students in the outputs</b>
Five PhD students were co-authors of the publications. One of the was the first author of the paper published in „Neural Development“, 2018.	
<b>D3.5</b>	<b>Participation of the team in master or bachelor studies</b>
The participation in master and bachelor studies is good given the small dimension of the group: five master and one bachelor theses were concluded in the evaluation period.	
<b>D3.6</b>	<b>Assessment of cooperation intensity with universities in the form of teaching</b>
Active cooperation with the Faculty of Medicine. There is a large number of lectures provided by members of the team.	

#### Further criterion: 4. Outreach activities (D4.1-D4.3)

<b>D4.1</b>	<b>Sufficiency of media strategy and activities in the area of research popularisation</b>
Team members participate in the „Open Door Day“ activities of the Institute. The aim of this event is to popularize science to general public and to secondary school students. Team members are regular participants of the annual „Science Fair“ in Prague.	
<b>D4.2</b>	<b>Publishing activities and its quality</b>
None reported.	
<b>D4.3</b>	<b>Participation in professional organisations in the area of research and development</b>
The team leader is a member of the Board of the Institute of Molecular Genetics, CAS.	

**Other comments of the commission:**

## 5. Department of Functional Organization of Biomembranes

### Strengths:

The group evolved from a microscopy core facility and has strong interdisciplinary skills, which attracts collaborations and promotes productivity.

### Weaknesses:

The team is too small, which limits the productivity, the applications for grants and makes the team financially unstable. The research activities are dependent on students' engagement.

### Opportunities:

Skilled researchers in microscopy techniques with access to microscopy core facility attracts collaborative work and promotes quality outputs and visibility. This may represent a strategy to expand the group.

### Threats:

Funding instability and lack of sufficient manpower to perform experimental work. Very small, almost under critical size of the group.

### Main criterion: 1. Quality of results (H1.1-H1.5)

<b>H1.1</b>	<b>Quality of selected outputs of Phase I</b>
The output of the team is below average regarding both ranking by the Phase I evaluation and number of publications. (total number of outputs 14; FTE 5.48, average rating 2.71, $N_{1,2}/FTE = 0.55$ ).	
<b>H1.2</b>	<b>Contribution of workers on the outputs reached</b>
Contribution of workers on the outputs reached corresponds roughly to the field characteristics average ( $FC_{1,2}/FTE = 0.26$ , $N_{RP1,2}/FTE = 0.36$ ).	
<b>H1.3</b>	<b>Quality of all outputs and results</b>
The output of the team is below average (number of all outputs: 14). Most outputs are in the second and third quality groups in terms of journal ranking. The citation intensity pattern is better, publications eligible for evaluation obtained citations that place them mostly in the second quartile.	
<b>H1.4</b>	<b>The most valuable discoveries and findings in the fields, their importance for the field</b>
Novel mechanism of the regulation of mRNA degradation, new yeast model of Barth syndrome, membrane sphingolipid-enriched microdomains depend on membrane potential. Development of new methods of quantitative analysis of fluorescence microscopy data.	
<b>H1.5</b>	<b>Contribution of the participation of the authors in large collaborations</b>
Not applicable.	

## Main criterion: 2. Societal relevance (H2.1-H2.5)

<b>H2.1</b>	<b>Societal relevance of outputs and results pursuant to CAS and institute mission</b>
Societal relevance is not clear.	
<b>H2.2</b>	<b>System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team's activity on proper practice in society in the area of social sciences and humanities</b>
Not applicable.	
<b>H2.3</b>	<b>Relation to practice</b>
No applied results are reported.	
<b>H2.4</b>	<b>Participation in AV21 strategy</b>
None known.	
<b>H2.5</b>	<b>Cooperation with regions of the Czech Republic</b>
None known.	

## Further criterion: 1. Position in international and national context (D1.1-D1.3)

<b>D1.1</b>	<b>Comparison of the team with similar international and national institutes</b>
Given the small size of the group and the fact that the group was recently established and still serves in part as a microscopy facility for the wider community, the quality can be considered good compared to other international a national institutes.	
<b>D1.2</b>	<b>Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation</b>
The team is involved in several domestic and foreign bilateral collaborations. The benefit is typically mutual, providing complementary approaches and methods. No broad consortial cooperations reported.	
<b>D1.3</b>	<b>Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)</b>
The team PI seems to be the only eligible person to participate in these activities. He took part in the organization of one international conference, gave one invited lecture, and is member of several professional committees and boards and one journal editorial board.	

## Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

<b>D2.1</b>	<b>Direction in line with the perspective of the planned research directions</b>
Yes.	
<b>D2.2</b>	<b>Assessment of the previous research objectives and their achievement</b>



Not applicable.	
<b>D2.3</b>	<b>Assessment of implementation of recommendations from past evaluation</b>
Not applicable. The team is being evaluated for the first time.	
<b>D2.4</b>	<b>Success in receiving grants</b>
The team was successful in receiving national grants (5 grants awarded during the evaluation period).	
<b>D2.5</b>	<b>Adequacy of instrumental equipment</b>
The team has the necessary equipment to produce high level scientific results. The current equipment makes possible a high-level multidisciplinary approach and fosters collaborations.	
<b>D2.6</b>	<b>Effectiveness of management</b>
The management seems to have been efficient regarding the team growth and funding.	
<b>D2.7</b>	<b>Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth</b>
For the time being, the team shows good structure for the size of the group, young team.	
<b>D2.8</b>	<b>Creating work-life balance conditions, assessment of approach towards possible gender issues</b>
With two male researchers (PI + postdoc) 3 female PhD students and 4 female technicians formally there is no gender problem, but it is hard to assess for such a small team.	
<b>D2.9</b>	<b>Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.</b>
None known.	

### Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

<b>D3.1</b>	<b>Scope of cooperation with universities on national and international level</b>
Team leader participates actively in the teaching and in the supervision of the students.	
<b>D3.2</b>	<b>Effectiveness of joint research centres</b>
The team has not been involved in joint research centres.	
<b>D3.3</b>	<b>Success rate in supervision of PhD students</b>
No PhD theses concluded so far.	
<b>D3.4</b>	<b>Participation of PhD students in the outputs</b>
Very good. Students are co-authors of half of the outputs produced during the period of evaluation.	
<b>D3.5</b>	<b>Participation of the team in master or bachelor studies</b>
The team here means the PI alone. 1 bachelor student defended the thesis.	

<b>D3.6</b>	<b>Assessment of cooperation intensity with universities in the form of teaching</b>
Active cooperation with universities in the form of teaching.	

**Further criterion: 4. Outreach activities (D4.1-D4.3)**

<b>D4.1</b>	<b>Sufficiency of media strategy and activities in the area of research popularisation</b>
Adequate; team participates in activities mainly towards school students (open day and science fair).	
<b>D4.2</b>	<b>Publishing activities and its quality</b>
Not reported.	
<b>D4.3</b>	<b>Participation in professional organisations in the area of research and development</b>
The team leader was member of the Academy Assembly of the Czech Academy of Sciences.	

**Other comments of the commission:**

## 6. Department of Genetic Toxicology and Nanotoxicology

Note by the commission: According to the Institution's home page and to the report of the Department, the Department of Genetic Toxicology and Nanotoxicology was split to form two separate Departments: The Department of Genetic Toxicology and Epigenetics (DGTE) and the Department of Nanotoxicology and Molecular Epidemiology. The commission states that its evaluation covers the research activities of the 'mother' department described in its report. These are the toxic effects of engineered nanoparticles, the toxic effects of combustion originated particles, and the molecular epidemiology of the effect of pollution on human health. The commission cannot comment on the re-organization of the department.

### Strengths:

The Department studies avoidable health hazards that affect large populations worldwide. Consequently, the projects have great translational values. Their work is carried out within broad international collaborations. Members of the Department have an excellent publication activity. It is a well-funded and well-directed department.

### Weaknesses:

Unfortunately, numerous outputs were published in average and below average journals. Very low output of PhD, Master and Bachelor theses. Low attractiveness of the Department for students?

### Opportunities:

The Department is in a position to provide the scientific basis for important political decisions with regard to public health. The Department should concentrate the resources and focus on fewer research areas and should use the international and domestic collaborations more effectively.

### Threats:

The lack of critical mass of scientists working on a specific project, too long time required for a complete study.

### Main criterion: 1. Quality of results (H1.1-H1.5)

<b>H1.1</b>	<b>Quality of selected outputs of Phase I</b>
The quality of selected outputs (19) is in large part very good, and in part excellent. Seven outputs were published in quartile 1 journals, with 3 in excellent journals (first decile).	
<b>H1.2</b>	<b>Contribution of workers on the outputs reached</b>
All publications reflect a significant contribution of scientists of the Department, either in a leading role, or by providing essential contributions. In general, the papers show team efforts and the participation of various subspecialties.	
<b>H1.3</b>	<b>Quality of all outputs and results</b>
The department is very productive with regard to the number of papers; they list 74 papers published between 2015 and 2019. The quality of outputs is overall very good, twenty-five papers were published in quartile 1 journals, with 8 of these in excellent journals (first decile). In term of international interest (citations) they published 4-5 significant papers that were frequently cited (more than 5 citations/year). This is a good track record since a third of the publications are well positioned. However, the Department publishes a substantial portion of their papers in average or below average level journals.	

<b>H1.4</b>	<b>The most valuable discoveries and findings in the fields, their importance for the field</b>
The Department has successfully investigated the toxic effects of various nanoparticles. They have shown that long-term exposure to nanoparticles affects the DNA methylation profile. They provided evidence on epigenetic memory processes during adaptation to environmental stress. They described the effects of air pollution on the gene expression profile in healthy newborns from diverse localities of the Czech Republic. They found increases in the risk of cardiovascular and respiratory admissions associated with exposure to particulate matter of aerodynamic diameter < 2.5 µm.	
<b>H1.5</b>	<b>Contribution of the participation of the authors in large collaborations</b>
Not applicable here.	

## Main criterion: 2. Societal relevance (H2.1-H2.5)

<b>H2.1</b>	<b>Societal relevance of outputs and results pursuant to CAS and institute mission</b>
The societal relevance of outputs and results is very high, since the research projects have significant relevance for public health. The researchers investigate problems connected to the technology developments and warn of old and new health hazards. The novelty of the investigations is that they try to explore the molecular mechanisms behind the toxic effects, and thereby support causality of effects observed by association. Consequently, the results could and should have a strong impact on political decisions.	
<b>H2.2</b>	<b>System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team's activity on proper practice in society in the area of social sciences and humanities</b>
Although the Department conducts basic biological research with practical aspects it can have a significant influence on the general society. The scientists attempt to explore the hazards of new technologies including motorization and nanomaterials. Therefore, it is important to inform the society of potential health risks, and to provide information for science-guided political decisions.	
<b>H2.3</b>	<b>Relation to practice</b>
Most of the studies have strong relation to the everyday life and experiences. The general pollution has been exposed to various environmental stress (air pollution, synthetic materials etc.) There are specific professions and age groups which are at high risk. Therefore, the research activity of the Department has a great translational value.	
<b>H2.4</b>	<b>Participation in AV21 strategy</b>
No information as to this query was provided by the Department.	
<b>H2.5</b>	<b>Cooperation with regions of the Czech Republic</b>
The Department is unique in the Czech Republic; therefore, it has a great responsibility. The International Advisory Board got convinced that the researchers are aware of the challenges and the difficulties. They investigate relevant subjects for the entire society. The results could easily be transferred and utilized by the international community.	

### Further criterion: 1. Position in international and national context (D1.1-D1.3)

<b>D1.1</b>	<b>Comparison of the team with similar international and national institutes</b>
The Department is in a leading position nationally, and is highly visible and recognized internationally. Its research focus is on global health challenges caused by long- or short-term exposition to various and harmful environmental stressors, causing negative health effects and/or deregulation of biomarker levels. Therefore, the studies are in the mainstream of international research and even civil interest. Although there are similar challenges all around the world the local situations should carefully be studied. The general observations like epigenetic changes and the analysis of the positive or negative adaptation processes are in line with the international trends.	
<b>D1.2</b>	<b>Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation</b>
The Department developed intensive cooperation with domestic and foreign institutions and research groups of similar scope during the period under evaluation. It is engaged in numerous national cooperation such as the HAIE project (Healthy Aging in Industrial Environment) and the Research infrastructure NanoEnvicZ (Nanomaterials and nanotechnologies for environment protection and sustainable future). In the international context, the Department now has common projects with German, Norwegian and Finnish teams. They were very successful in applying for EU grants (COST, FP7 and Horizon2020), and these types of funding created a solid financial base for the research and have encouraged cooperative problem solving.	
<b>D1.3</b>	<b>Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)</b>
<p>The Department has been represented in domestic and international societies and commissions. The senior scientists actively participate in the science policy forming committees. Members of the Department organized 5 conferences, meetings and workshops, and were invited to give 8 (international) lectures.</p> <p>Dr. Šrám was awarded the Alexander Hollander price of the Environmental Mutagenesis &amp; Genomics Society (USA) in 2017, and received the medal of the Czech Academy of Sciences “De scientia et humanitate optime meritis” in 2019.</p>	

### Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

<b>D2.1</b>	<b>Direction in line with the perspective of the planned research directions</b>
The Department has reached most aims set for the period of 2015-2019. The team developed new approaches in genetic toxicology, molecular epidemiology, nanotoxicology and epigenetics. Important research foci were nanosafety and the adverse effects of air pollution. Particular emphasis was given to the health effects of combustion emissions.	
<b>D2.2</b>	<b>Assessment of the previous research objectives and their achievement</b>
The Department has intensified both external and internal collaborations. The researchers have initiated several joint projects and have increased the quality of the research. Their efforts are reflected in more papers which clarified several novel mechanisms of nanotoxicology and related epigenetics.	
<b>D2.3</b>	<b>Assessment of implementation of recommendations from past evaluation</b>

<p>The team implemented all recommendations from the previous evaluation. There was a change in the leadership. In addition, structural changes were initiated for the formation of 2 smaller departments, focused on the more specific problems of environmental toxicology. Additional cooperations within the IEM and with other CAS institutes were initiated. The Department enhanced and modified its publication activity, resulting in an increasing frequency of citation.</p>	
<b>D2.4</b>	<b>Success in receiving grants</b>
<p>The Department was successful in receiving grants from both domestic (7 grants, mostly Czech Science Foundation) and international resources (9 EU grants). Unfortunately, and it has already generally been stated the grant structure does not allow planning sustainable major projects.</p>	
<b>D2.5</b>	<b>Adequacy of instrumental equipment</b>
<p>The Department has not complained about missing important instrumental infrastructure. The IEM provides a wide range of research means and the core facilities could effectively be used. Of course, the ongoing development of the examining methods requires more and more new technology, but the constant renewal is part of the strategy of the Institute and the departments.</p>	
<b>D2.6</b>	<b>Effectiveness of management</b>
<p>The Department has gone through structural changes during the last year. These affected the research foci and the management in many aspects. Departmental management in accordance with the leaders of the IEM was able to enhance the productivity during the evaluated period. It reflects the effectiveness of their work.</p>	
<b>D2.7</b>	<b>Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth</b>
<p>Most of the questions raised here can't be handled at departmental level. The existing HR policy of the IEM is in accordance with the modern research institutions. Now we must consider the two new Departments (Department of Nanotoxicology and Molecular Epidemiology and Department of Genetic Toxicology and Epigenetics) which have the similar size and composition of scientists. Altogether around 20 scientists and the supporting staff is to continue the projects of the mother department. As indicated all the scientist possess the required qualification. The low number of PhD students (2+1) is an important warning signal for the future.</p>	
<b>D2.8</b>	<b>Creating work-life balance conditions, assessment of approach towards possible gender issues</b>
<p>It is hard to see the details of the work-life conditions either from the reports submitted or the presentations. If you look at the composition of the Departments that originated from the mother Department, we see a balanced gender distribution (about half of the employees are male and female).</p>	
<b>D2.9</b>	<b>Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.</b>
<p>The Department participates in the large research infrastructure entitled 'Nanomaterials and nanotechnologies for environment protection and sustainable future' which has been integrated with the Roadmap of Large Infrastructures for Research, Experimental Development and Innovation of the Czech Republic since 2016. This newly built research infrastructure uniquely interconnects major Czech research institutions and universities</p>	

involved in research in the field of nanomaterials and nanotechnologies for environmental protection and sustainable processes.

### Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

<b>D3.1</b>	<b>Scope of cooperation with universities on national and international level</b>
They report on 4 major projects conducted by the involvement of domestic universities (Technical University of Liberec, Palacký University Olomouc, Technical University of Liberec and J.E. Purkyne University in Ústí nad Labem): Based on their self-report these forms of cooperation have been fruitful and have created a solid base for concentrated and coordinated research.	
<b>D3.2</b>	<b>Effectiveness of joint research centres</b>
No information as to this point was provided in the report of the Department.	
<b>D3.3</b>	<b>Success rate in supervision of PhD students</b>
Since this is the largest team in the IEM the output of the PhD studies remains poor; no PhD student defended her/his thesis. It might be closely connected to the surprising fact that no BSc and only 1 MS student is listed among the supervised students.	
<b>D3.4</b>	<b>Participation of PhD students in the outputs</b>
During the 5-years period under evaluation the Department supervised 6 PhD students, who were involved in the research projects. Given the size of the Department, this number is too low. Also, it is unclear why none of these students finished their thesis in the evaluation period. Their involvement has been demonstrated and documented as co-authors of the publications and presentations on national and international conferences. PhD students participated in projects directly related to their thesis, but mostly they were involved in other research projects as team members.	
<b>D3.5</b>	<b>Participation of the team in master or bachelor studies</b>
For unexplored causes there is a low interest among the BSc and MS students for the Department. The senior scientists are involved in the teaching programs of two universities which are located far from the mother institution. It can be one of the multiple causes of the modest students' involvement.	
<b>D3.6</b>	<b>Assessment of cooperation intensity with universities in the form of teaching</b>
In the relevant period the senior scientists had significant teaching activity in two universities in the form of Bachelor, Master and PhD programs. There is no information on the popularity and the attendance of the courses, seminars hold. The subjects taught are relevant and fascinating.	

### Further criterion: 4. Outreach activities (D4.1-D4.3)

<b>D4.1</b>	<b>Sufficiency of media strategy and activities in the area of research popularisation</b>
The Department was very active in popularization via "Open Door" day and "Week of science and technology". Numerous interviews on Czech TV and radio channels regarding air pollution levels, nanosafety and the toxic effects of engine emissions were given.	

Members of the Department gave several lectures for the public on nanotoxicology and the health effects of air pollution.	
<b>D4.2</b>	<b>Publishing activities and its quality</b>
No information was given in the report of the Department with regard to publications for popularization.	
<b>D4.3</b>	<b>Participation in professional organisations in the area of research and development</b>
Members of the Department are active members in scientific associations, serve on editorial boards of scientific journals, and are members of scientific councils.	

**Other comments of the commission:**



## 7. Department of Molecular Biology of Cancer

### Strengths:

The department has an excellent publication record during the evaluated period. Impressive international collaboration in large consortia. Very good track record of the team leader, and a convincing research plan.

### Weaknesses:

The stability of this small team depends on the opportunities to continuously recruit students and postdoc willing to stay and apply for grants. Hard to keep a critical mass for long term project. At present, there appears to be no concept and collaboration with clinicians for translation of the results into the clinical practice.

### Opportunities:

With such publication track record, the group leader should be able to have more support from the CAS or external grants. The department should have the strength to get important financial supports.

### Threats:

The low financing support could jeopardize the future stability of the department.

### Main criterion: 1. Quality of results (H1.1-H1.5)

H1.1	Quality of selected outputs of Phase I
The quality of the selected outputs of Phase I is very good, in part excellent. The results have predominately been published in top international journals. Thirteen of 17 outputs were published in the first quartile of journals, 6 of these are considered excellent (published in the first decile).	
H1.2	Contribution of workers on the outputs reached
In some of the outputs, team members were in a leading position. In all others, including those that resulted from large collaborations (so-called multi-author papers), the team provided essential contributions (e.g. samples, assays etc.).	
H1.3	Quality of all outputs and results
The overall quality of outputs is very good, in a substantial part excellent. Twenty four of 64 outputs were published in the first quartile of journals, 10 of these are considered excellent (published in first decile journals). Nineteen outputs were published in second quartile journals. The excellent outputs predominantly resulted from large collaborations. Citation of these outputs was good.	
H1.4	The most valuable discoveries and findings in the fields, their importance for the field
In their report, the team describes a concept of non-invasive liquid biopsy, where biomarkers for various types of cancer such as colorectal, pancreatic, ovarian and breast cancer are being sought in the urine and stools of the patients and control subjects. These studies are complemented by functional in vitro studies on cell lines. The team describes in the following areas: (1) genetic landscape of the malignant diseases, (2) mutational hallmarks and epigenetics of malignant diseases, (3) chromosomal and DNA damage and repair in malignant diseases, and (4) other findings in molecular oncology with their participation.	

<b>H1.5</b>	<b>Contribution of the participation of the authors in large collaborations</b>
Team member efficiently contributed to large collaborations, leading to outstanding consortial publication (Nature Genetics, Nature Medicine for example).	

## Main criterion: 2. Societal relevance (H2.1-H2.5)

<b>H2.1</b>	<b>Societal relevance of outputs and results pursuant to CAS and institute mission</b>
Societal relevance of the research topic is very high. Biomarkers of DNA damage are extremely important for diagnosis and prognosis of colorectal, pancreatic and ovarian cancers. Thus, there is a very strong societal relevance of the outputs for prevention and treatment of cancer.	
<b>H2.2</b>	<b>System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team's activity on proper practice in society in the area of social sciences and humanities</b>
Not enough information available provided by the team.	
<b>H2.3</b>	<b>Relation to practice</b>
The department collaborates with medical faculties in the Czech Republic and abroad. However, it seems that theses collaborations mainly provide human samples, and are too weak for a translation of results into the clinical practice. Towards this goal, a clear concept and strong collaborations with domestic clinicians is necessary. Or does the Department solely rely on the expertise of the (foreign) partners in the consortia?	
<b>H2.4</b>	<b>Participation in AV21 strategy</b>
No information as to this point was provided by the team.	
<b>H2.5</b>	<b>Cooperation with regions of the Czech Republic</b>
The department has an impressive list of national cooperation.	

## Further criterion: 1. Position in international and national context (D1.1-D1.3)

<b>D1.1</b>	<b>Comparison of the team with similar international and national institutes</b>
Compared with groups in the Czech Republic, the Department is in an outstanding and leading position. In the international context, the Department is highly visible and recognized in a highly competitive field.	
<b>D1.2</b>	<b>Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation</b>
The Department participates in three consortia. The first one is COGENT (Colorectal cancer genetics), comprising mainly of European partners. They have been members since 2007 and the collaboration comprises of an exchange of samples and knowledge. A number of publications have arisen from this collaboration as well as one Special Issue in Mutagenesis, entitled Colorectal cancer-current insight into susceptibility (Guest editor Pavel Vodicka). The second one is US-based consortium GECCO (Genetics of colorectal cancer). It comprises	

<p>of a few European members and about 20 US universities (members since 2011). Likewise, the consortium intends to share samples, information and knowledge. Participants were encouraged to write down individual small projects and all others provided consent and samples for these studies. The consortium holds annual meetings, mainly in Seattle, WA. Several high impact publications have appeared in the last 1 and half years (Nature Genetics, Gastroenterology, Nature Communications). The main strength is in the possession of samples from almost 100,000 patients with colorectal cancer. The third consortium, PANDORA, is focused on the research of pancreatic cancer. We became one of the first members in 2009. This is an exclusively European consortium, but it collaborates tightly with the National Institute of Health, Bethesda, MD. A number of sound publications have emerged from this collaboration. The consortium mainly coordinates its activity at annual meetings and regular phone conferences.</p>	
<b>D1.3</b>	<b>Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)</b>
<p>Members of the Department organized two conferences/workshops in the evaluation period (Workshop 'Genomics, epigenomics and microenvironment of colorectal cancer' in 2019 and Conference on the 'Genetic susceptibility to colorectal cancer' in 2016.</p> <p>Members of the Department received invitations for lectures at MD Anderson Cancer Centre and at Baylor College of Medicine, Houston, TX, USA.</p>	

## Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

<b>D2.1</b>	<b>Direction in line with the perspective of the planned research directions</b>
<p>The research program is convincing and clearly in line with the previous objectives and perspectives. The department should continue according to their excellent plans.</p>	
<b>D2.2</b>	<b>Assessment of the previous research objectives and their achievement</b>
<p>A large part of the previous objectives was reached. The department should continue its convincing work.</p>	
<b>D2.3</b>	<b>Assessment of implementation of recommendations from past evaluation</b>
<p>In the past evaluation, it was recommended that the Institute reconsiders the structure of the Department which included a Department of Teratology. This recommendation was implemented.</p> <p>Furthermore, the group leader received important feedback by the newly formed International Advisory Board of the Institute and decided to implement these mid-term recommendations.</p>	
<b>D2.4</b>	<b>Success in receiving grants</b>
<p>Impressive success in receiving domestic grants. At present, there appear to be no international (EU) grants. The financial situation seems to be very good, but the group leader clearly stated the instability of short-term CAS funding.</p>	
<b>D2.5</b>	<b>Adequacy of instrumental equipment</b>
<p>Not enough information described in the report or presentation.</p>	
<b>D2.6</b>	<b>Effectiveness of management</b>
<p>Not enough information described in the report or presentation.</p>	

<b>D2.7</b>	<b>Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth</b>
Not enough information described in the report or presentation.	
<b>D2.8</b>	<b>Creating work-life balance conditions, assessment of approach towards possible gender issues</b>
Not enough information described in the report or presentation.	
<b>D2.9</b>	<b>Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.</b>
No information described in the report or presentation.	

### Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

<b>D3.1</b>	<b>Scope of cooperation with universities on national and international level</b>
The group collaborates closely with universities. Pavel Vodicka and several other members of the Department are employed partially at the Institute of Biology and Medical Genetics, 1st faculty of medicine, Charles University in Prague and/or Biomedical Centre at Medical Faculty in Pilsen, Charles University in Prague. The co-PIs are from Medical Faculty in Hradec Kralove, collaboration is carried out with Medical Faculty, Masaryk University in Brno.	
<b>D3.2</b>	<b>Effectiveness of joint research centres</b>
No information as to this point was presented in the report of the Department.	
<b>D3.3</b>	<b>Success rate in supervision of PhD students</b>
1 PhD student successfully defended his thesis during the evaluated period. This number does not reflect the productivity of the group. The department has now 8 PhD students.	
<b>D3.4</b>	<b>Participation of PhD students in the outputs</b>
<p>From the report: „It is compulsory for each PhD student to participate in the research of the Department, and consequently to the outcomes. The PhD thesis must be based on at least one publication with a student as first author and several others as co-authors. PhD students are the main driving force advancing the laboratory work.“</p> <p>It is clear that PhD students efficiently participated in the outputs and are most of the time first author of the publications.</p>	
<b>D3.5</b>	<b>Participation of the team in master or bachelor studies</b>
The group supervised the master thesis of 5 master students and 1 bachelor student.	
<b>D3.6</b>	<b>Assessment of cooperation intensity with universities in the form of teaching</b>
<p>Senior scientists of the Department intensively participated in bachelor education at Charles University and gave a total of 245 lectures for graduate students.</p> <p>Group members are also member of committee for PhD training (Pharmacology, molecular biology, human physiology).</p>	

#### Further criterion: 4. Outreach activities (D4.1-D4.3)

<b>D4.1</b>	<b>Sufficiency of media strategy and activities in the area of research popularisation</b>
In its report, the Department state that it has participated in all popularization activities arranged by the PR manager. In 2015, Pavel Vodicka gave an interview on public Czech TV on pancreatic cancer.	
<b>D4.2</b>	<b>Publishing activities and its quality</b>
The Department provided no information as to this point.	
<b>D4.3</b>	<b>Participation in professional organisations in the area of research and development</b>
<p>Activities listed in the report of the Department:</p> <p>Pavel Vodicka is an active member of AACR (American Association of Cancer Research). He is a member of Editorial Boards of several international journals (such as Scientific Reports etc.). Pavel Vodicka, Veronika Vymetalkova and Ludmila Vodickova act regularly as reviewers of manuscripts submitted into reputable international journals. Pavel Vodicka has been evaluating proposals in the frame of H2020, Brussel, Belgium and acted as an expert for IARC, Lyons, France. He has become an evaluator of Associate Professorship at MD Anderson Cancer Centre, Houston, TX and full professorship at University in St. Johns, Newfoundland. Pavel Vodicka is a member of the panel in the Czech Science Foundation and Grant Agency of the Ministry of Health, Czech Republic.</p>	

**Other comments of the commission:**

## 8. Department of Neuroregeneration

### Strengths:

The Department has a significant publication activity. It benefits from a strong collaboration network, and is closely linked to the other teams within the Institute. The Department uses state-of-the-art experimental models for neuroregeneration. Furthermore, it is very active in PhD and undergraduate training.

### Weaknesses:

The group is poorly funded. Their research program appears still too broad and heterogenous. There seems to be no concrete plan on when and how the results could be tested in humans and translated into the clinic.

### Opportunities:

Stem cell research for neuroregeneration is a hot area. They must display their unique skills for stronger international interest and collaboration. The young co-workers can bring new methods and fresh ideas.

### Threats:

The lack of financial stability can induce uncertainty and fluctuations within the group.

### Main criterion: 1. Quality of results (H1.1-H1.5)

<b>H1.1</b>	<b>Quality of selected outputs of Phase I</b>
The quality of the selected outputs of Phase I (25) is in large part very good, a few outputs are excellent. 13 outputs were published in quarter 1 journals, 9 in quarter 2. Four outputs were published in excellent journals (decile 1).	
<b>H1.2</b>	<b>Contribution of workers on the outputs reached</b>
A large part of the collaborative publications received a strong and significant contribution from the members of the department.	
<b>H1.3</b>	<b>Quality of all outputs and results</b>
The overall quality of outputs (80) is above average (27 in Q2 journals) or very good (18 in Q1 journals), a few are excellent (7 in decile 1). Some of their papers received significant interest: During the reporting period, 5-6 articles with significant international impact (> 5 citations/year) were published.	
<b>H1.4</b>	<b>The most valuable discoveries and findings in the fields, their importance for the field</b>
The department confirmed that induced pluripotent stem cells (iPS-NPs) are probably the most suitable candidate for the treatment of spinal cord injury (SCI) due to their robust survival, tissue sparing, reduction of glial scarring, and increased axonal sprouting. They further studied whether the intrathecal application of neural progenitors is comparably efficient as intraspinal and discovered there is a positive effect on SCI, but it is less robust following intraspinal application. The group studied the immunomodulatory properties of neural stem cells in SCI and found a reduction in activity of the proinflammatory pathway NFkB after stem cell application, which led to reduced levels of TNFa and lesser astrogliosis). They developed simple protocols for NP differentiation and expansion in collaboration with a stem cell bank in Valencia. They tested, in a collaboration project a polymer hydrogel as a cell carrier for iPS-NPs in a chronic model of SCI and found a good	

graft survival, reduced cavitation, increased number of tyrosine hydroxylase and fibres in a lesion, and a trend in functional outcome improvement.	
<b>H1.5</b>	<b>Contribution of the participation of the authors in large collaborations</b>
Not applicable here.	

## Main criterion: 2. Societal relevance (H2.1-H2.5)

<b>H2.1</b>	<b>Societal relevance of outputs and results pursuant to CAS and institute mission</b>
There are many exciting open questions in the field of neuroregeneration since the central nervous system was regarded incapable of regeneration for a long time. The activity of the Department is important for the general policy of the CAS to generate and transfer knowledge.	
<b>H2.2</b>	<b>System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team's activity on proper practice in society in the area of social sciences and humanities</b>
Although the focus of the department's interest shifted to basic science recently, they have attempted to open towards applied research and translational medicine. Their work has great translational potential, if they could continue the investigations to preclinical studies since here is a great interest in the application of different types of stem cells to treat neurological disorder. Stem cell research attracted the public interest years ago, since it promised to open new avenues in regenerative medicine. It is the responsibility of the scientists to explore the field as much as possible and give a realistic picture to the public.	
<b>H2.3</b>	<b>Relation to practice</b>
The regenerative neuroscience has a great potential for the practice. Depending on the disease, regenerative strategies include replacing neurons, inducing plasticity and connectivity, stimulating remyelination, and regenerating the astrocytic compartment. There are several good examples indicating that	
<b>H2.4</b>	<b>Participation in AV21 strategy</b>
No information as to this point was presented by the Department.	
<b>H2.5</b>	<b>Cooperation with regions of the Czech Republic</b>
The Department has numerous collaborations within the Institute and in Czech Republic. The effectiveness of them are well documented in the papers published recently. The team is also cooperating with small enterprises e.g. Biolnova (CZ) to increase the translational potential of the research.	

## Further criterion: 1. Position in international and national context (D1.1-D1.3)

<b>D1.1</b>	<b>Comparison of the team with similar international and national institutes</b>
The team is among the leading groups with a similar scope in the Czech Republic, and it is visible and recognized in the international context.	

<p>There are similar institutions and departments in many countries and universities all around the world. Their program focuses on studies to understand the basic mechanisms involved in neurodegeneration or neurologic injury in various chronic and acute diseases (like Parkinson's disease, stroke and Alzheimer's disease, ALS etc.). Scientists use mainly pluripotent stem cells, which can develop into any cell type in the body, to study these disorders. This type of work is relevant to many additional disorders of the nervous system, such as autism, schizophrenia, major depression, bipolar disease, stroke, peripheral nerve disease and chronic pain. Therefore, the group is in the mainstream that is very competitive but also very challenging. They are still in the race.</p>	
<b>D1.2</b>	<b>Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation</b>
<p>The Department has numerous long-term international collaborations. One of the most significant is the membership in Centre for Reconstruction Neuroscience - Neurorecon - that joins research teams from IEM, University of Cambridge, Centro de Investigación Príncipe Felipe in Valencia, and University of Leeds. The project encompasses the creation and development of an excellent research team headed by a prominent scientist, (James Fawcett). The project builds on the existing research activities of the IEM, in connection with its implementation, will strengthen the quality of research at international level: the acquisition of a lack of infrastructures and intensifying international cooperation.</p>	
<b>D1.3</b>	<b>Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)</b>
<p>The senior scientists from the Department are involved in the work of various professional societies and committees. They organized or co-organized 4 national and 5 international conferences. Dr. Jendelova and Dr. Kwok gave 5 and 4 invited lectures, respectively. Members of the department received several awards such as 'best publication prizes.</p>	

## Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

<b>D2.1</b>	<b>Direction in line with the perspective of the planned research directions</b>
<p>Following the structural changes, the Department continued two major projects inherited from the Department of Neuroscience. It was in line with their original plan and created a professional stability for the researchers. Their achievements are more than remarkable since they have published important results in prestigious journals.</p>	
<b>D2.2</b>	<b>Assessment of the previous research objectives and their achievement</b>
<p>The department continued with the development of novel strategies for the treatment of stroke and cerebral ischemia, using a combination of advanced biomaterial science with stem cell therapy. In accordance with their plans, the group compared the repeated intrathecal application of mesenchymal stem cells (MSC) and conditioned medium obtained from these cells in the treatment of an animal model of ALS disease, and combined it with the intramuscular application of MSC at the onset of the disease. They have published more than 30 papers on that issues.</p>	
<b>D2.3</b>	<b>Assessment of implementation of recommendations from past evaluation</b>
<p>They have implemented the recommendations of the previous evaluation. As recommended, they put more efforts to preclinical experiments to support the proof of concept of stem cell-based technologies in relevant animal models with appropriate readouts. The group carried out precise preclinical studies to unravel the mechanism of</p>	



stem cell action in host organisms and studied the effect of 3 different types of stem cells in a clinically relevant model of spinal cord lesion.	
<b>D2.4</b>	<b>Success in receiving grants</b>
The Department was successful in acquiring domestic grants, and the financing seems stable in short-term. However, there appears to be no international (EU) funding at present. The long-term financing is similar to the other groups in the IEM.	
<b>D2.5</b>	<b>Adequacy of instrumental equipment</b>
Neither the reports submitted, nor the presentations and discussions revealed major problems with the instrumentation and research infrastructure. The IEM has well-equipped laboratories and core-facilities. The institutional policy of research development is remarkable.	
<b>D2.6</b>	<b>Effectiveness of management</b>
It is hard to evaluate that issue since it is the ratio of work invested to the outcomes. The statistics (number of publications, financial support by grants, size, and composition of the department) indicates that an effective management backs the Department.	
<b>D2.7</b>	<b>Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth</b>
The Department currently has 15 employees, 8 PhD and 4 undergraduate students, that can be regarded as a good composition. All the scientists possess the required degrees and qualifications. As stated, attracting young or established scientists is an ongoing challenge for the departments and Institute. There is a great need for good researchers, good PhD students all around the word. The working circumstances, carrier opportunities, salaries and family issues all influence the mobility which is required in some degree. The major question to make a healthy balance between the in and out movements. There was no recognizable problem on that issue when discussed with the representatives of the Department or the Institute.	
<b>D2.8</b>	<b>Creating work-life balance conditions, assessment of approach towards possible gender issues</b>
The gender composition of the department reflects that 20 out of 26 members are women. It is hard to find the optimal ratio in work-life relationship. The management seemed to be demanding and at the same time tolerant. The challenges (like international competition, social system, pandemic situation) enforce the cooperation within workplaces.	
<b>D2.9</b>	<b>Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.</b>
No information as to this query was presented by the team.	

### Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

<b>D3.1</b>	<b>Scope of cooperation with universities on national and international level</b>
There are various forms of the cooperation with domestic and international universities. The major activity is the common and complementing research. The senior scientists exhibit strong teaching activities mainly at the Charles University. They participate in all the three levels of education (Bachelor, Master, and doctoral studies). Although their	

involvement is documented they still would like to strengthen the participation in the university faculties. It could be appreciated since organic relationships are the most productive ways of attracting new students or initiating common research projects, and helps in enhancing the staff mobility.	
<b>D3.2</b>	<b>Effectiveness of joint research centres</b>
Members of the department are also members of BIOCEV (joint project of six CAS institutes and two faculties of Charles University in Prague (Faculty of Science and 1st Faculty of Medicine). The department members collaborate within BIOCEV with the Institute of Biotechnology and the Czech BioImaging infrastructure.	
<b>D3.3</b>	<b>Success rate in supervision of PhD students</b>
PhD students of the Department are in the Doctoral program in Neuroscience of the Second Medical Faculty Charles University in Prague. The University covers all the courses, the group is responsible for research and publishing activities. The success rate (7 defended theses in 5 years) is in the good range.	
<b>D3.4</b>	<b>Participation of PhD students in the outputs</b>
PhD students are involved in all research projects of the team. This includes the experimental work as well as the publishing of research articles as co-authors, and the presentation of research results at scientific meetings and conferences. Each PhD student must publish 3 peer-reviewed publications, one of them as a first author. Consequently, PhD students have contributed to nearly all published articles.	
<b>D3.5</b>	<b>Participation of the team in master or bachelor studies</b>
The Department displays strong educational activity at 4-5 universities. The senior investigators have courses and seminars and they attract students who prepare their thesis in the laboratories. Three master and 4 bachelor theses were successfully defended during the evaluation period.	
<b>D3.6</b>	<b>Assessment of cooperation intensity with universities in the form of teaching</b>
The teaching activity of the Department at various universities is strong. As listed in the self-report, the scientists hold not only specific courses but some of them teach at basic science courses. The universities have their quality control systems and it assures the quality of the courses and teachers.	

#### Further criterion: 4. Outreach activities (D4.1-D4.3)

<b>D4.1</b>	<b>Sufficiency of media strategy and activities in the area of research popularisation</b>
As reported, recently many outreach activities were coordinated on an institutional level including the traditional “Open house in Academy of Sciences” usually takes place annually in November. The Department takes part in many events, it invited guests from non-scientific fields and gives lectures and practical excursions, providing the opportunity to investigate scientific workplaces, laboratories and learn how science is conducted. As many Departments working on neuroscience they are also involved in Brain awareness week. The team is integral part of the Science Fair event organized by the CAS. In addition, they have opened towards secondary school students and they invite talented secondary students and give them opportunities to be involved in the scientific research.	

<b>D4.2</b>	<b>Publishing activities and its quality</b>
No information as to publications in the area of research popularization was given by the team.	
<b>D4.3</b>	<b>Participation in professional organisations in the area of research and development</b>
The Department is represented in professional organizations at high level (IBRO, Czech National Foundation). The senior scientists from the group are involved in wide range of editorial, reviewer and other professional committees. This type of activity is some kind of recognition of excellent achievements and at the same time it is a time-consuming, mainly unpaid occupation.	

**Other comments of the commission:**

## 9. Department of Tissue Engineering

The research foci of the Department are development of artificial tissues, mainly biodegradable scaffolds, such as nanofibers, foams, hydrogels, and decellularized tissues for the regeneration of incisional hernia, skin, cartilage, and bone. There is research activity on computer modelling of protein structures. In addition, the Department is involved in development of controlled drug delivery for targeted release of drugs into the site of therapy, and three-dimensional nanofibers for improved cell growth and differentiation.

### Strengths:

Wide-range domestic and international cooperation. High potential for translation of results/products into clinical practice.

### Weaknesses:

There is a high turnover of personnel within the group. Stability would require a longer stay of established and more experienced scientists. Links to clinical medicine are weak. The research program is too broad and heterogenous for the size of the team.

### Opportunities:

To remain in the mainstream of a booming research area. Good chances for international grants.

### Threats:

The high turnover of personnel could affect the potential of the team and threaten its competitiveness.

## Main criterion: 1. Quality of results (H1.1-H1.5)

<b>H1.1</b>	<b>Quality of selected outputs of Phase I</b>
The quality of the selected outputs of Phase I is good, in part very good. Three of 13 outputs were published in first quartile journals, nine in 2nd quartile journals. Two outputs were published in excellent journals (first decile). Seven of the 13 papers received international interest, as indicated by the citation rate (> 4 -5 citations/year).	
<b>H1.2</b>	<b>Contribution of workers on the outputs reached</b>
With a few exemptions the researchers of the Department contributed significantly in the publications. In collaborative papers, they were either in a leading position or provided essential data.	
<b>H1.3</b>	<b>Quality of all outputs and results</b>
The Department published a total of 39 articles (IF=115) and 1 patent during the 5-year period under evaluation. The overall quality of outputs is good, in part very good. Fifteen papers were published in Q1 or Q2 journals. The average impact factor is over 3. The Czech Republic is listed among the 30 best countries in tissue engineering and biomaterials. Most of the recognized work was done by the Department, indicating a highly visible position in the international community of biomaterials and tissue engineering research.	
<b>H1.4</b>	<b>The most valuable discoveries and findings in the fields, their importance for the field</b>
Tissue engineering aims to fabricate functional tissue for applications in regenerative medicine and drug testing. More recently, 3D printing has shown great promise in tissue	

<p>fabrication with a structural control from micro- to macro-scale. The Department has been dealing with hot issues of this vibrant research area. Researchers from the Department have developed novel technologies to produce nanofibers, mainly core-shell nanofibers, needleless electrospinning, and alternating current (AC) spinning. Materials were further tested as scaffolds for cells and for the delivery of growth factors, bioactive substances, and/or proteins. These systems have broad applications in tissue engineering applications, for the delivery of proteins, drugs, and chemical substances. E.g. they developed self-assembling nanoparticles encapsulating zoledronic acid (NZ) that allowed a higher intratumor delivery of the drug compared with free zoledronic acid in an in-vivo model of prostate cancer. Their findings are important for the international community and help in opening new ways in the regenerative medicine.</p>	
<b>H1.5</b>	<b>Contribution of the participation of the authors in large collaborations</b>
Not applicable here.	

## Main criterion: 2. Societal relevance (H2.1-H2.5)

<b>H2.1</b>	<b>Societal relevance of outputs and results pursuant to CAS and institute mission</b>
<p>Tissue engineering is a promising life-science research field that has shown enormous potential for effective tissue/organ repair and regeneration. Significant advances in the tissue engineering field have resulted in engineered functional organs (in dish and in some experimental animals). Even more, applications in cancer research, in vitro models for drug screening and disease modelling have recently been developed. Therefore, the research by the department is fitting the international trends, their methods are update and most of their work has a good quality. It has been a multidisciplinary high-tech research that requires a precise interplay of various experts.</p>	
<b>H2.2</b>	<b>System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team´s activity on proper practice in society in the area of social sciences and humanities</b>
<p>The field of tissue engineering and regenerative medicine has captured the attention and imagination of young and established scientists, as well as the public and medical and biotech industries. Therefore, it is one of the most rapidly developing fields in biomedicine. Although the Department works on exciting issues the interpretations remain realistic. For better knowledge transfer they prepared videos for the public that present their research. The video is available on the website of the Department.</p>	
<b>H2.3</b>	<b>Relation to practice</b>
<p>Tissue engineering represents a unique multidisciplinary translational science incorporating the principles of biomaterial engineering, the molecular biology of cells and genes, and the clinical sciences of reconstruction. It requires intensive, combined efforts of scientists, engineers, and clinicians. The goal is the successful translation of the laboratory findings to the practice. Towards this aim, a stronger involvement and cooperation with clinical scientists is necessary.</p>	
<b>H2.4</b>	<b>Participation in AV21 strategy</b>
No information as to this query was provided by the team.	
<b>H2.5</b>	<b>Cooperation with regions of the Czech Republic</b>

They maintain intensive and well-documented collaboration within the Czech Republic with the universities of Prague, Brno, Liberec, Pilsen located in different regions of the country. These interactions resulted in meaningful publications and successful grant applications.

### Further criterion: 1. Position in international and national context (D1.1-D1.3)

<b>D1.1</b>	<b>Comparison of the team with similar international and national institutes</b>
The department is highly recognized nationally, and is visible in the international context. The research field of tissue engineering (and regenerative medicine) is very competitive. Most of the leading universities all-around of the world have established departments or centres for encouraging these types of investigations. Numerous journals are devoted to the research topic. It is a great accomplishment and opportunity that the IEM has established that Department. There is a lot to discover and they are in the mainstream.	
<b>D1.2</b>	<b>Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation</b>
Each publication of the Department reflects intensive collaboration with domestic and foreign scientists. These collaborations resulted in the successful application for prestigious grants. Based on the successful work, the department is now involved in two international grants and numerous projects (10 participating partners from international environment). It has been an important engagement and generates lot of interaction. The goals of the Department through this opportunity are to improve research activities, to share knowledge, devices, methodologies, and to start novel international collaborations.	
<b>D1.3</b>	<b>Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)</b>
This activity was at a satisfactory level between 2015-19. Scientists of the team co-organized 4 conferences and workshops.  Eva Filová gave an invited lecture at the conference Human Biomechanics in Prague, 2018. She was awarded the Best Presentation Prize at the World Academia of Science, Engineering and Technology (WASET) conference in Rome 2016.	

### Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

<b>D2.1</b>	<b>Direction in line with the perspective of the planned research directions</b>
The Department kept the main directions and worked on the planned projects. It is almost impossible to fabricate solid plans for a 5 years period nowadays when science booms almost in all details. The major responsibility is to fulfil the requirements in the individual grants. However, they continued their work on osteochondral regeneration and put more specific focus on osteoporotic defects. They were successful with projects on bone regeneration together with academic institutions and companies, where they will continue the development novel scaffolds and therapies based on cell and cell-free approaches.	
<b>D2.2</b>	<b>Assessment of the previous research objectives and their achievement</b>
The productivity of the Department has markedly increased since the last evaluation. Not only the number of papers (from 24 to 37, more than 50%), but the strength of them (IF has increased from 68 to 115). The group also extended the external collaboration with academic institutes, and companies in the Czech Republic and Europe. The spectrum of	

the investigations has broadened, the perform studies besides the regeneration of bone and cartilage also on the regeneration of soft tissues. Furthermore, the group worked on the development of novel methods for the preparation of nanofibers, microparticles and drug delivery systems.	
<b>D2.3</b>	<b>Assessment of implementation of recommendations from past evaluation</b>
The Department considered all the recommendations of the past evaluation. According to the opportunities and the limiting factors they have changed their strategy. Novel methods and new co-operations have been established that positively increased the output. The team has increased, more FTE is available for the research. Some of the former PhD students continued the work in post-doc position.	
<b>D2.4</b>	<b>Success in receiving grants</b>
According to information found on the Department's home page currently there are 10 grants supporting the research. Eight of 10 are coming from domestic resources and 2 are supported by the EU. Considering the size of the Department, this level of funding through research grant sis very good.	
<b>D2.5</b>	<b>Adequacy of instrumental equipment</b>
The Department has no complains about lacking major instrumental infrastructure.	
<b>D2.6</b>	<b>Effectiveness of management</b>
The effectiveness of management is always reflected by the outputs of the Department. In brief, the productivity has increased, the quality of the publication changed for better and the group has increased. One can conclude that the management backed the Department effectively.	
<b>D2.7</b>	<b>Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth</b>
The Department invests a lot in shaping the professional structure to the right form. They put a lot of efforts into having new graduate and post-graduate (PhD) students, ambitious young co-workers. It is obvious from their self-repot that the key of the success is the good composition and motivation of the team. The age-structure is assuring, most of the co-workers belong to the young generation that involves lot of unexplored reserves in critical thinking and creativity.	
<b>D2.8</b>	<b>Creating work-life balance conditions, assessment of approach towards possible gender issues</b>
Within the department most of the employees are women. It could create a family friendly environment and can be beneficial for finding a work-life balance. It is hard to judge since young women are frequently at the same time mothers, wives and they have demanding jobs. To solve these problems is the common job of the management and the team-members.	
<b>D2.9</b>	<b>Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.</b>
No information as to this point was given in written the report and the presentation of the team.	

### Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

<b>D3.1</b>	<b>Scope of cooperation with universities on national and international level</b>
The main scope of the cooperation with universities remains the coordinated research and optimal use of human and instrumental infrastructure. Besides the scientific work some of the team members teach at various levels of the university curricula (Second Faculty of Medicine, Charles University in Prague, Technical University Liberec and faculty of Mechanical Engineering, Czech Technical University). Their involvement is remarkable. The international cooperation is mainly common research but there are joint efforts in training of undergraduate, graduate and PhD students.	
<b>D3.2</b>	<b>Effectiveness of joint research centres</b>
The report of the team lists 3 bilateral cooperations with Czech universities. It is hard to judge the effectiveness, but the publications and the success of the grant applications indicate the success of the cooperations.	
<b>D3.3</b>	<b>Success rate in supervision of PhD students</b>
During 5-year under evaluation 9 PhD students participated in research activities of the Department. As documented 7 of them have already defended their thesis theses. This is quite a high success rate indicating a high level of supervision and training.	
<b>D3.4</b>	<b>Participation of PhD students in the outputs</b>
The involvement of the PhD students in the projects is usually very high and contributed significantly to the output of the Department. PhD students are listed as the first authors, corresponding authors, or co-authors of 30 publications.	
<b>D3.5</b>	<b>Participation of the team in master or bachelor studies</b>
During the 5 years period 7 master students and 2 bachelor students participated in the research activities of the Department. They successfully completed their studies and defended their diploma work. Their activities are sufficiently recognized in the publications and presentations by the Department.	
<b>D3.6</b>	<b>Assessment of cooperation intensity with universities in the form of teaching</b>
The major activity of the Department within the cooperation with universities is the research which has been documented in the various papers published together. Members of the Department participate actively in university training in the form of seminars and practice courses. As there has been a growing interest in tissue engineering, the team will hopefully organize courses for PhD students in the future.	

### Further criterion: 4. Outreach activities (D4.1-D4.3)

<b>D4.1</b>	<b>Sufficiency of media strategy and activities in the area of research popularisation</b>
The Department takes part in the annual project “Open science” organized mainly for students from secondary schools. Members of the Department participated in the Science Fair which is organized by the Czech Academy of Sciences for students from grammar and secondary schools.	



<b>D4.2</b>	<b>Publishing activities and its quality</b>
No information was presented as to this point.	
<b>D4.3</b>	<b>Participation in professional organisations in the area of research and development</b>
The representation of the Department in the professional organizations is moderate. Some of their scientific achievements were appreciated and awarded at conferences and even at the governmental level.	

**Other comments of the commission:**

## 10. Department of Transplantation Immunology

### Strengths:

Focused research program. Good experience with the education of young diploma and PhD students and their involvement in the research of the team.

### Weaknesses:

Relatively small team with few active international cooperations. No clear interaction with the clinic for future development of therapy in human.

### Opportunities:

The team is now part of the Department of Nanotoxicology and Molecular Epidemiology. If an appropriate candidate is identified, the team could become independent. The CAS should support the re-establishment of the team.

### Threats:

The insertion in the Department of Nanotoxicology and Molecular Epidemiology might dilute the possibilities of funding. If the funding for the „transplantation immunology“ member decreases, it will be difficult for the CAS to support the re-establishment of an independent department.

### Main criterion: 1. Quality of results (H1.1-H1.5)

<b>H1.1</b>	<b>Quality of selected outputs of Phase I</b>
The quality of selected outputs of Phase I is overall good. Five of 11 papers were published in quartile 2 journals, 1 in a quartile 1 journal. No paper was published in an excellent journal (decile 1). A couple of their papers got significant international interest since they got cited well.	
<b>H1.2</b>	<b>Contribution of workers on the outputs reached</b>
A great part of their publication reveals a strong and significant contribution of the members from the department.	
<b>H1.3</b>	<b>Quality of all outputs and results</b>
The quality of all outputs is good, 12 of 35 papers were published in quartile 2 journals, 2 in quartile 1 journals. No paper was published in an excellent journal. However, it has to be noted that the team, during the evaluated period, significantly increased the number and quality of publications (IF >5). This is a positive tendency for the re-establishment of the future department. The development of 3 utility patterns (2 in 2018 and 1 in 2017) has to be mentioned.	
<b>H1.4</b>	<b>The most valuable discoveries and findings in the fields, their importance for the field</b>
Morphine negatively influences functions of mesenchymal stem cells, and this effect might be a reason for decreased and aberrant tissue healing observed in opioid addicts. Inhalation of nanoparticles has negative impacts on cells and functions of the immune system.	
<b>H1.5</b>	<b>Contribution of the participation of the authors in large collaborations</b>
Not applicable here.	

## Main criterion: 2. Societal relevance (H2.1-H2.5)

<b>H2.1</b>	<b>Societal relevance of outputs and results pursuant to CAS and institute mission</b>
The knowledge of the mechanisms of transplantation reaction, nanotechnology, and stem cell utilization allows to design and test new therapies which can improve quality of the life.	
<b>H2.2</b>	<b>System functionality for knowledge transfer into practise, its usefulness for society. The impact of the team's activity on proper practice in society in the area of social sciences and humanities</b>
The research and knowledge obtained by the Team has a great future translational potential and value for long-term treatment of ocular diseases (cornea injury). In the evaluation period, the Team has secured IP with 3 utility patterns (patents).	
<b>H2.3</b>	<b>Relation to practice</b>
Despite a mentioned collaboration with the Clinic of Ophthalmology, 1st Medical Faculty, Charles University, Prague (Cell therapy of retinal diseases) the team does not seem to have clearly established relation to practice.	
<b>H2.4</b>	<b>Participation in AV21 strategy</b>
No information available to the commission.	
<b>H2.5</b>	<b>Cooperation with regions of the Czech Republic</b>
Close cooperation between the team and Faculty of Science in Prague. This cooperation is supported by common grants and by the exchange and co-education of diploma and PhD students. The team of the Department of Transplantation Immunology was also involved as co-applicant in the research program of two large projects, the Centre of Cell Therapy and Tissue Regeneration and the Centre of Genomics and Proteomics in the IEM of CAS.	

## Further criterion: 1. Position in international and national context (D1.1-D1.3)

<b>D1.1</b>	<b>Comparison of the team with similar international and national institutes</b>
The team is highly recognized among the Czech groups with a similar scope. Its international visibility is restricted to a few collaboration partners.	
<b>D1.2</b>	<b>Scope and quality of international and national cooperation and the role of the team in such cooperation; engagement in broad international cooperation</b>
The team was involved in cooperation with Sorbonne University, and University of Warsaw. The team had a long-term cooperation with the Department of Ophthalmology, University of Aberdeen, Scotland, on the study of immunity and tolerance in the eye. PhD students and post-doctors regularly worked in the laboratory of Prof. Forrester and this cooperation resulted in 10 common publications dealing with corneal and limbal transplantation and with the study of immunity in the eye.	
<b>D1.3</b>	<b>Participation of the workers in scientific community activities (organizing of conferences and workshops, invited lectures, awards)</b>
The department did not organize any conferences or workshops.	

After reaching age 65, the leader of the team Prof. Holáň decided to decline all invitations for invited lectures and conference attendance abroad. He was only invited to a few lectures at domestic meetings of the Czech Transplantation Society and to other domestic lectures.

The members of the Department presented the results at the congresses of the European Society for Vision and Eye Research, TERMIS congresses and at other international meetings, and as invited speakers at domestic meetings. M. Krulová presented our results as an invited speaker in the lecture at the International Conference on Stem Cells and Regenerative Medicine, Tokyo, Japan, and as an invited speaker at a few domestic meetings.

## Further criterion: 2. Vitality, sustainability and strategy (D2.1-D2.9)

<b>D2.1</b>	<b>Direction in line with the perspective of the planned research directions</b>
Following the structural changes, the Department continued two major projects. It was in line with their original plan, and the results were published in respected journals. As reported, in the evaluated period, they extended their research to the study of the impact of opioids or nanoparticles on stem cells and their regenerative properties, and started a new project (supported by the grant) focused on the possibility to induce transplantation tolerance with stem cells.	
<b>D2.2</b>	<b>Assessment of the previous research objectives and their achievement</b>
As reported, in the evaluated period, they extended their research to the study of the impact of opioids or nanoparticles on stem cells and their regenerative properties, and started a new project (supported by the grant) focused on the possibility to induce transplantation tolerance with stem cells.	
<b>D2.3</b>	<b>Assessment of implementation of recommendations from past evaluation</b>
The report of the Team claims that the main concern i.e. the age structure of the team was addressed by incorporating it into the newly established Department of Nanotoxicology and Molecular Epidemiology. This evolution seems to have a positive influence on the cooperation and triggered new joined projects. The team is actively working on recruiting new PhD students.	
<b>D2.4</b>	<b>Success in receiving grants</b>
The Department was successful in domestic grant applications, but the financing seems lower than that of other departments of the IEM. The long-term financing is clearly uncertain. The team does not have any international grant.	
<b>D2.5</b>	<b>Adequacy of instrumental equipment</b>
The instrumental equipment of the team seems appropriate.	
<b>D2.6</b>	<b>Effectiveness of management</b>
No comment. The team has only recently been integrated into the Department of Nanotoxicology and Molecular Epidemiology.	
<b>D2.7</b>	<b>Assessment of professional structure, development strategy and the strategy of keeping best scientists, age structure, career and qualification growth</b>

It is not possible to answer this query at this point in. The team has recently been integrated into another department due to the age of its former head. A re-establishment is possible only if an appropriate PI is identified.	
<b>D2.8</b>	<b>Creating work-life balance conditions, assessment of approach towards possible gender issues</b>
No information available to the commission.	
<b>D2.9</b>	<b>Relation of the team with regard to the integration, development and sustainability of the research centre funded by the National Programme of Sustainability II.</b>
Not enough information available.	

### Further criterion: 3. Cooperation with universities and participation in education (D3.1-D3.6)

<b>D3.1</b>	<b>Scope of cooperation with universities on national and international level</b>
A former PhD student Assoc. Prof. M. Krulová is a leader of Laboratory of immunoregulation, Department of Cell Biology, Faculty of Science, Charles University. There is close cooperation between the team in IEM and Faculty of Science in Prague. This cooperation is supported by common grants and by the exchange and co-education of diploma and PhD students. The research in these cooperating teams is focused on stem cells and their interactions with immunosuppressive drugs and on the combination of MSC treatment with the application of immunosuppressive drugs for the effective suppression of immunity.	
<b>D3.2</b>	<b>Effectiveness of joint research centres</b>
The scientific cooperation resulted in a number of common publications (4 mentioned in the reports with 2 IF >5).	
<b>D3.3</b>	<b>Success rate in supervision of PhD students</b>
PhD students of the Department are in the Doctoral program of the Second Medical Faculty Charles University in Prague. The University covers all the courses, the group is responsible for research and publishing activities. The success rate (3 defended theses in 5 years) is in the good range for the small size of the team.	
<b>D3.4</b>	<b>Participation of PhD students in the outputs</b>
They significantly contributed to the research program and also for the implementation of the tasks of the Department. In the report, there is no further information as to the authorship of PhD students in publications.	
<b>D3.5</b>	<b>Participation of the team in master or bachelor studies</b>
The team displays strong educational activity for bachelor and master students (14 bachelor and 11 master students during the evaluated period).	
<b>D3.6</b>	<b>Assessment of cooperation intensity with universities in the form of teaching</b>
The Department displays good educational activity at Charles University at bachelor and master's degrees. As listed in the self-report, the scientists do not hold specific undergraduate courses or others in the curricula of the university.	

#### Further criterion: 4. Outreach activities (D4.1-D4.3)

<b>D4.1</b>	<b>Sufficiency of media strategy and activities in the area of research popularisation</b>
Prof. V. Holáň had a few television and radio talks in the evaluated period, in which he spoke about the possibilities and perspectives of stem cell-based therapy for the treatment of severe damage of the ocular surface and for the treatment of, to date, incurable retinal degenerative diseases.	
<b>D4.2</b>	<b>Publishing activities and its quality</b>
No information available to the commission.	
<b>D4.3</b>	<b>Participation in professional organisations in the area of research and development</b>
Prof. M. Krulová, has been the Head of Subject area on the board of Immunology, Doctoral study programmes in Biomedicine, Charles University since 2020. V. Holáň is a member of the Editorial Board of the World Journal of Transplantation, and was the member of the Committee of the Czech Immunological Society.	

**Other comments of the commission:**

**Final report was elaborated by:**

**Commission 5.1 - Biological sciences A**

**Evaluated teams No.: 4, 5**

**Commission Chair: Prof.emer., PhD, DrHC Morten Kielland-Brandt**

Commission Deputy Chair: Graça Soveral

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Karl-Dieter Entian  
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Balázs Vajna  
Manfred Wuhrer  
László Zimányi

**Commission 8 - Medical and health sciences**

**Evaluated teams No.: 1, 2, 3, 6, 7, 8, 9, 10**

**Commission Chair: Prof. Dr. Hans-Georg Joost**

Commission Deputy Chair: Thomas Krieg

Commission Members:

Achim Aigner  
Ferenc Bari  
William Blalock  
Nicolas Catz  
Tammo Delhaas  
Jeremy Fauconnier  
Pawan Singal  
Robert Tomanek  
Viviana Trezza