

Research Programme

LIFE SCIENCE ENGINEERING - Innovative next-generation technologies for the exploration and application of tissue engineering

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1 Preamble

The global population has been growing steadily for years, while life expectancy has increased and the age structure has changed. It can therefore be assumed that the need for the treatment of age-related diseases will continue to increase in the future. Common diseases such as diabetes, cardiovascular diseases, chronic joint diseases such as osteoarthritis, as well as neurological diseases such as strokes, play a major role due to increasing incidences worldwide. In addition, the majority of patients require lifelong treatment or medication with current conventional therapies.

In this context, the demand for more resource-efficient healthcare services on the one hand and more efficient and better treatment methods, for example through personalised medicine, on the other is growing. The development of innovative biomedical technologies and applications will be of great importance in solving these challenges. The research field of Life Science Engineering plays a key role in this respect. It is dedicated to the development of innovative methods, technologies and processes. In interdisciplinary research approaches, experts from the engineering sciences work together with the necessary fields of life sciences, materials research, information technology and medicine in an application-orientated manner.

In Baden-Württemberg, the importance of research fields with a large thematic overlap to life science engineering was recognised at an early stage and important topics in this area have already been funded. With the very well-positioned research landscape of academic and non-university institutions in Baden-Württemberg, there is great potential for innovative projects to explore new technological approaches.

With regard to healthcare, the area of regenerative medicine has large reserves for innovative future technologies. This applies to many widespread diseases, but also to a wide range of other medical applications - from chronic wound treatment and the optimisation of regeneration in the field of implantology to robotics in the context of brain-machine interfaces.

The programme 'LIFE SCIENCE ENGINEERING - Innovative next-generation technologies for the exploration and application of tissue engineering' is intended to fund projects whose developments will lead to applications that contribute to better personalised therapies in the field of regenerative medicine. In addition, synergies resulting from the integration of various specialist disciplines are to be used for diverse developments and thus contribute to stronger, interdisciplinary networking of research groups from Baden-Württemberg. Finally, the research programme is intended to make an important contribution to further strengthening Baden-Württemberg's national and international position in regenerative medicine.

2 Aim and Subject of the Call

Regenerative medicine is the focus on the repair, replacement or regeneration of cells, tissues or organs in order to overcome functional disorders of any kind, including congenital defects, diseases, trauma and ageing. Regenerative medicine covers a number of research fields. While the strategy of cell-based therapy using stem cells had already been extensively researched long before the development of the field of regenerative medicine, research on cell-free therapies, tissue reprogramming and, most recently, tissue engineering in particular has received increasing attention in the past few years.

The 'LIFE SCIENCE ENGINEERING - Innovative next-generation technologies for the exploration and application of tissue engineering' research programme pursues **internationally competitive, excellent projects** with an application-oriented focus. The main goal is to **explore new methods, technologies and processes in combination with biomaterials** in order to make a concrete contribution to advancing the field of **tissue engineering as a discipline**.

In the context of regenerative medicine, tissue engineering focusses on the replacement of tissues and organs if they are permanently damaged by disease or injury, for example. Tissue engineering is based on several process steps. In recent years, the research field has benefited considerably from the integration of new scientific discoveries and, in particular, new innovative methods and technologies from scientifically distant research fields through interdisciplinary cooperation in order to automatise processes and thus make them more standardised and efficient. For example, methods for 3D printing processes have been adapted to precisely produce three-dimensional tissue and organs using a special 'bio-ink'.

Due to these major advances in recent years, tissue engineering is now at the link between basic and application-orientated research. Nevertheless, there are still unsolved challenges and important fields of action for **research in the laboratory** and in **translation** for use in patients that need to be further investigated.

This is precisely where the 'LIFE SCIENCE ENGINEERING' research programme comes in. Inspired by the engineering sciences, interdisciplinary research ideas for new and further developments of innovative future technologies are expected. The aim of the projects should be to demonstrate the full potential of the various developments with a **proof-of-concept**.

In this context, research ideas on the following research aspects, **for example**, can be addressed:

- 3D / 4D printing processes
- Organ-on-a-chip
- Microfluidics
- Biosensors & bioimaging
- Drug delivery systems & nanotechnology, etc.

As there is great room for thematic overlaps and technological links between research aspects, it is possible to address **several** research aspects in one project.

The programme **excludes** aspects of **research on stem cells**, e.g. in the context of the process step for expanding these cells. Research on materials (such as biomaterials, biocompatible materials and materials of biological origin) should be limited to **substantially** support technological development in the project.

In addition to specific technological challenges, there is also a need for research into **overarching fields of action** that will further advance the entire research field of tissue engineering. In recent years, the field of 'digitalisation' has become increasingly important not only in our everyday lives, but also in research. The recent revolutionary advances in the field of artificial intelligence (AI) offer huge potential for the future. Against this backdrop, projects that also incorporate **new digital technologies** from the fields of **AI, machine learning, modelling**, etc. as part of the above-mentioned research aspects are strongly encouraged.

The projects are to be **validated** primarily in an **application-oriented research question** in the field of **tissue engineering**. In the long term, the developments should also contribute to better healthcare in order to advance **personalised medicine** and the development of **novel therapies**. Innovative solutions require considerable interdisciplinary cooperation and integration of different areas of expertise in order to benefit from synergies. The projects should therefore generally be carried out in **co-operation**.

3 Eligibility criteria

All universities located in Baden-Württemberg and all non-profit non-university research institutions based in Baden-Württemberg are eligible to participate.

4 Terms and Conditions

The research is conducted on behalf of Baden-Württemberg Stiftung gGmbH on the basis of a contract with the research institution (contract research). All rights to the results are reserved by Baden-Württemberg Stiftung gGmbH.

The starting point of each research project should be a particular research issue that fits the objectives of the call. In addition, the research objectives should have concrete exploitation potential that could result in an application in the medium term.

Collaboration with a company is possible, but the company may only be involved as a subcontractor. Research institutions must also consider that companies may only receive a subcontract for services. This means that subcontractors may not carry out research themselves and it must be ensured that the project is organised in such a way that the project results can also be used by other companies. The amount that

companies can receive as subcontractors should not exceed 20% of the total project costs applied for. However, excessively high amounts may be a criterion for exclusion during the selection process, so the situation will be reviewed on a case-by-case basis.

Furthermore, the research institutions must ensure that suitable confidentiality agreements are signed with the companies as part of the contract research. In this way, it should be guaranteed that the knowledge remains with the Baden-Württemberg Stiftung.

Financing will be provided for personnel and material costs, travel expenses, and – in duly justified cases – investment costs in the form of depreciation throughout the project.

In general, projects should be realised in cooperation. Depending on the research question, an interdisciplinary approach is obligatory. Single projects are possible in justified exceptional cases. However, it must be demonstrated whether the competences required to work on the research project are available; this must be convincingly illustrated, especially for single projects.

If several research institutions are involved, a contact person must be appointed for the Baden-Württemberg Stiftung who act as coordinator for the research institutions and be responsible for the overall execution of the project.

A one-stage application procedure is envisaged. Applications must be submitted by the date specified below and will be evaluated by an independent panel of experts that will provide Baden-Württemberg Stiftung with recommendations for a decision.

The evaluation criteria are:

- Relevance of the topic with regard to the objectives of the call for proposals
- Scientific quality and level of innovation of the proposal
- Differentiation from the international state of the art
- Application relevance and economic added value
- Quality of the work plan
- Qualification of the working group/research institution/network
- Adequacy of the budget

Projects within the scope of this call for applications can be rejected without giving reasons. There is no entitlement to funding. By submitting a project description, applicants agree to these terms and conditions.

The project duration should not exceed 3 years. The Baden-Württemberg Stiftung gGmbH provides up to 4 million euros for this research programme.

5 Application Process

All applications from universities must be submitted by their rectorates. Applications from non-university research institutions must be submitted by their management.

6 Deadlines

Applications in German or English must be received by the project management organization **by 10th September 2024, 4 pm** (cut-off deadline).

Applications must be submitted electronically via Project Management Jülich's Internet portal <https://bws-lsengineering.ptj.de/>. The PDF document „Approval of legally binding“ signed by the rectorate of the university or the management of the research institutions must be uploaded to the portal. The signature in the PDF is sufficient.

The signed document must not be submitted by post or fax.

7 Scope and Content of Applications

The outline of the project application is specified in the online submission tool <https://bws-lsengineering.ptj.de/> and includes the following points:

- 1) General information (coordinator, partner, institution, title and acronym of project, legally valid signature)
- 2) Summary: brief, generally comprehensible description of the project in German
- 3) Objectives of the project
- 4) Innovation and relevance of the project compared to the current state of the art
- 5) Scientific background (own project-related preliminary work, publications and existing infrastructure)
- 6) Patent situation
- 7) Detailed presentation of the work plan with Gantt-chart
- 8) Milestone Plan: verifiable Milestones every six months for each project partners involved
- 9) Exploitation plan
- 10) Financial plan: Breakdown of **net cost**:
 - Personnel costs incl. person months and pay groups (financing is available for a maximum of € 86,100 /a for postdocs, € 79,800 /a for doctoral researchers, and € 57,600 /a for technical assistant – net costs)
 - Detailed material costs (small devices up to € 5,000, consumables, travel expenses)
 - Investment costs in justified exceptional cases (applicable to new investments of € 5,000 or more, depreciation period according to official depreciation table, billable depreciation only for the period of use during project)

- Overview of total costs
- For cooperation projects, a clearly differentiated financial plan must be provided that coherently presents the items and resources planned for each partner.

The overall size of the application documents is limited by the maximum number of characters in the input fields.

The requirements for applications are outlined in a guideline (<https://bws-lsengineering.ptj.de/>).

8 Project Management

Baden-Württemberg Stiftung gGmbH has commissioned Project Management Jülich (PtJ) with the implementation and monitoring of the research program. Project Management Jülich is responsible for the organizational aspects of the program and is the key contact for all applicants.

Contact details for PtJ:

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