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## Call for proposals

# "Chairs of excellence in Biology and Health"

Consultation page for the call for proposals <a href="https://anr.fr/Chaires-Excellence-2023">https://anr.fr/Chaires-Excellence-2023</a>

## **Summary**

The French Health Innovation Plan 2030 aims to return France to its position as leader in Biology and Health innovation. To reach the best international level, France must extend its commitment to the whole value chain, from basic Life Science research to translational and clinical health research, and support innovation. It must provide enough resources to attract or maintain nationally the world's top researchers in their field. These researchers, who are leaders in Biology and Health research, will strive to make France a leader among countries capable of producing scientific knowledge, of generating innovation and encouraging Biotech and Medtech development to improve public health, attract international investments, and major health industrials.

The Chairs of excellence in Biology and Health measure aims to provide leading researchers of all origins with significant funding to conduct new major projects, over a 5-year period, in France. These Chairs are either open to researchers already working in a French institution, or researchers working abroad and seeking to create a team or join a research institute in France. They will enable the development of their research programmes, and provide leverage to apply to major European calls for proposals.

The budget for this call is set at €80 million, for a maximum amount of €2 million per Chair (except for additional funding, as provided for by Article 2.1). This call will be subject to 3 rounds per year, namely 40 to 50 Chairs funded.

## Important dates

The application must absolutely be submitted electronically, including the documents signed by the legal representative of each partner, before:

## CLOSING DATE TO SUBMIT THE LETTERS OF INTENT (STAGE 1)

Round 1: 20 June 2023 at 11:00 am (CEST)

Round 2: 21 September 2023 at 11:00 am (CEST)

Round 3: 23 April 2024 at 11:00 am (CEST)

at:

https://france2030.agencerecherche.fr/chaires-excellence-lettre-2023

CLOSING DATE TO SUBMIT FULL PROPOSALS (STAGE 2)

Round 1: 17 October 2023 at 11:00 am (CEST)

Round 2: 16 January 2024 at 11:00 am (CET)

Round 3: 10 September 2024 at 11:00 am (CEST)

at:

https://france2030.agencerecherche.fr/chaires-excellence-dossier-2023

The dates for the next rounds will be announced on the dedicated page for this call for proposals:

https://anr.fr/Chaires-Excellence-2023

## **ANR Contacts**

Scientific Project Manager: Kévin PASSADOR

**Programme Manager: Constance BOYER** 

For any question regarding the call for proposals: chaires.excellence@anr.fr

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## 1.Background and objectives of the call for proposals

## 1.1. Background

A substantial effort has been made to encourage translational and clinical research, through successive waves of Hospital-University Research in health (RHU) programmes, under France 2030, providing significant multi-year funding (€8 million for 5 years on average). This effort will be renewed within the framework of the Health Innovation Plan 2030. This measure, which focuses on applied health research projects still at an early stage and coordinated by academics, is supplemented by the i-Démo call for proposals (former PSPC) from the structural component of France 2030 intended for industrial holders, and on the priority areas identified, which are biotherapy and bioproduction, e-health and emerging infectious diseases, using 3 acceleration strategies in the management component of the Investment for the Future programme (PIA4) covering the entire innovation value chain.

Thought partnership-based research funding is most appropriate to accelerate the transfer of innovation, arising from scientific discoveries to the industry, and then to implement multi-centre therapeutic trials with high level of evidence required for their market authorisation, when it comes to Life Sciences research, it may rely heavily on individual funding, especially if these are substantial enough to implement ground-breaking projects focusing on new research fronts coordinated by leading researchers.

With regard to the funding of young researchers, the relevant funding instruments, whether it be individual funding (ANR young researchers) or funding to establish new research teams using the ATIP/AVENIR programme from the CNRS and INSERM, have proven to be successful.

The European Research Council (ERC), a real European success, provides such funding to individual researchers conducting extremely ambitious proposals, in 3 career development categories (ERC Junior, Consolidator, Advanced, with possible extensions using the "proof of concept" measure). The sums allocated range from €1.5 to €2.5 billion for up to 5 years per proposal.

If the ERC plays and must keep on playing a key role in France to support the best researchers in Life Sciences, the number of successful applicants is limited due to a highly competitive European programme (approximately 30 per year, in all categories). Overall, this number remains exceptionally low and stagnant, in health as in other scientific fields. Yet, alternatives to ERC, in terms of funding for biomedical research teams producing discoveries leading to health innovations, are currently limited in France, particularly for mid-career or "senior" researchers.

## 1.2. Objectives of the call for proposals

This call for proposals aims to fund Chairs in Biology and Health, over a 5-year period, for research focusing on Life Sciences that may lead to Biology and Health innovations.

The funding of these Chairs aims to increase France's attractiveness for top-level researchers, keep top researchers in leading-edge teams, and increase the number of applications to international calls for proposals such as ERC Advanced and Consolidator.

The budget of this call is set at €80 million, for a maximum amount of €2 million per Chair, for 5 years.

Recipients will be selected through a <u>two-stage call for proposals</u>, with 3 rounds per year, to ensure high responsiveness.

## 2. Proposals expected

### 2.1. Main characteristics

With this in mind, the Chairs of excellence in Biology and Health must meet the following criteria:

- These Chairs are intended for researchers in Biology and Health, within the meaning of human health, covering, in particular, Life Sciences (LS) 1 to 7 and sections of LS9 in line with Health, as defined in the ERC (LS1 to LS7 and LS9 1-6, see appendix 1):
- They are open to all top-level researchers already established in a French institution or researchers working abroad,
- If selected, a Chair candidate shall submit an application to the ERC, in the appropriate category (particularly ERC Advanced or Consolidator, but also, Synergy or Proof of Concept if relevant).
- This funding may allow the arrival in France of a researcher who was previously working abroad, and encourage his/her establishment. The applicant undertakes to work full-time in a host laboratory within 24 months after the start of the project. A 50% minimum time commitment in France is required in the event of continued activity abroad throughout this transitional period intended to ease the transition;
- These Chairs will help researchers with more than 7 seven years of research experience after their thesis defense, and at least a 7 years perspective before retirement, depending on their status (especially with regard to the possibilities offered by the Research Programming Law (LPR) to postpone retirement in the event of an ERC or France 2030 funding),
- Chairs must help fund the development of a new major project over a 5-year period,
- These Chairs may receive France 2030 funding up to €2 million, including the salary of the recipient if he/she does not hold a permanent position.
- Additional funding up to €1 million, intended for the purchase and operation (including staff) of massive and critical equipment for the project, unavailable in the host laboratory nor on its site, may be exceptionally requested. For applicants working abroad, this additional amount may increase up to €3 million to support specific equipment needs and their operation (including staff),
- These Chairs may be hosted in France, in public scientific, cultural or professional establishments such as universities, public scientific technological establishments, public institutions of industrial and commercial nature or other non-profit research institutions, as well as health care institutions,
- Chairs must be hosted in environments of excellence encouraging the development of the research programme proposed, which must be supported by the host laboratory and its supervising authorities through a letter, guaranteeing a minimal installation space (approximately 100m² for a mid-career profile) and providing a suitable environment to develop the research project proposed, and a financial commitment for the proposal,
- Funding is provided to an applicant / host laboratory couple, bound together for the duration of the project. Therefore, the funding provided for this project may not be transferred to a substitute scientific manager or host laboratory.

#### 2.2. Partners

Partners who receive funding are French higher education and/or research institutions (public or private and non-profit), or groupings of these institutions, as well as health care institutions (public or private and non-profit). Private companies may act as partners within the projects

but will not receive any funding for their involvement. Grants will be paid by the ANR to the Coordinating Institution supervising the host laboratory.

## 3. Application review

Recipients will be selected through a <u>two-stage call for proposals</u>, with 3 rounds per year, to ensure high responsiveness.

The application submission process consists of 2 stages.

The first stage involves submitting a letter of intent, with a presentation of the applicant and host laboratory, and a brief description of the project proposed. This first stage is a pre-selection stage. Only pre-selected applicants will be invited to submit a full proposal and will be interviewed.

## 3.1. Review of the letters of intent (Stage 1)

In stage 1, the letters of intent (Template is provided in the call for proposals website) must describe:

- The qualifications and experience of the applicant, including management skills, the funding granted throughout his/her career, and his/her international positioning.
- The commitment of the host laboratory and its relevance with the project proposed by the applicant,
- A brief description of the scientific project.

#### 3.1.1. Letters of intent review process

The ANR reviews the admissibility of the letters of intent, under the criteria listed in paragraph 3.1.2.

The co-presidents of the panel and members of the French Interministerial Steering Committee for Health (ISC) evaluate and divide the applications into two categories:

- A-rated applications invited to submit a full proposal in stage 2,
- B-rated applications not selected as is, but likely to be re-submitted as part of a future round, under the recommendations issued and a deadline set by the reviewers.

#### 3.1.2. Letters of intent admissibility criteria

- 1- The letter of intent must be filed in full on the ANR submission website before the closing date and time to submit the letter of intent for one of the rounds listed in page 3.
- 2- The letter of intent (5 pages maximum) must follow the template available on the call for proposals website listed in page 1 and be submitted under unprotected PDF format.
- 3- An applicant may only submit one letter of intent.
- 4- The applicant must have more than 7 seven years of research experience after his/her thesis defense.
- 5- The applicant must have at least 7 years before retirement at the time of application.

#### 3.1.3. Letters of intent evaluation criteria

Only applications meeting the admissibility criteria will be evaluated on the following criteria:

- Profile and experience of the applicant in ground-breaking research, innovation, education, management and leadership,
- Capacity of the applicant to conduct the project proposed,
- Synergy of the applicant and host laboratory with regard to the objectives of the project proposed.

## 3.2. Full proposal review (Stage 2)

Full proposals must describe:

- The state of the art and opportunities that the proposal represents,
- The scientific proposal, its key stages and deliverables,
- A presentation of all partners involved in the proposal,
- A detailed argumentation of the budget required for the project, in compliance with the financial regulations on this "Chairs of excellence in Biology and Health" measure,
- A detailed financial appendix (contributions, co-funding and aid requested) signed by each partner institution.

#### 3.2.1. Full proposal review process

The ANR reviews the admissibility of the full proposals, under the criteria listed in paragraph 3.2.2.

Members of the panel evaluate the full proposals and interview the applicants under the criteria listed in paragraph 3.2.3. The panel divides the proposals in two categories:

- A-rated proposals recommended for funding by the panel,
- B-rated proposals not recommended, as is, for funding by the panel. Upon recommendation by the panel, the applicant will be invited or not to re-submit an application as part of a future round for full proposals.

The panel delivers its ranking and evaluation reports to the Health ISC.

The list of selected applications is established by the Prime Minister, based on a proposal from the Health ISC and an opinion of the French General Secretariat for Investment (SGPI). Recipients will be contracted by the ANR.

#### 3.2.2. Full proposal admissibility criteria

- 1- The application must be filed in full on the ANR submission website before the call for proposals closing date of one of the rounds of the call for proposals listed in page 3.
- 2- The administrative and financial document (the template available on the dedicated page of this call for proposals must be used) signed by each partner and scanned, must be deposited on the ANR submission website before the closing date and time of a given round.
- 3- The scientific document (15 pages maximum) must follow the template available on the dedicated page of the call for proposals, be submitted under unprotected PDF format and not exceed the number of pages maximum allowed (minimum font size 11, Times New Roman or equivalent).

- 4- The proposal must be consistent with one of the fields of application in paragraph 2.1 and in appendix.
- 5- The Coordinating Institution must be a French higher education and research institution (universities, research institutions, etc.) or a health care institution, whether public or private and non-profit.
- 6- The project proposed must last five years (60 months).
- 7- The applicant undertakes to work full-time in a host laboratory within 24 months after the start of the project. A 50% minimum time commitment in France is required in the event of continued activity abroad throughout this transitional period intended to ease the transition.

#### **IMPORTANT**

The applications that do not meet the admissibility criteria will not be submitted to the panel and will in no way be eligible for funding.

#### 3.2.3. Full proposal evaluation criteria

The full proposals meeting the admissibility criteria will be evaluated by the panel, which may be supported by external peer-reviewers, based on the following criteria:

#### 1/ SCIENTIFIC EXCELLENCE AND AMBITION OF THE PROPOSAL

- Relevance of the proposal and the objectives announced.
- Novelty, innovative nature and quality of the proposal with respect to the state of the art.
- Clarity of research objectives and hypotheses,
- Relevance of the methodology, scientific risk management.
- Feasibility.
- Complementarity and quality of the partners and researchers involved.

#### 2/ ORGANISATION AND RESOURCES DEPLOYED

- Adequacy of the budget proposed (aid requested and contributions from the hosting institution and partner institutions) with the objectives set out.
- Justification of any additional funding requirements for outstanding equipment.
- Scientific risk identification and management.
- Relevance of the timetable, consistency of the deliverables, feasibility of the stages proposed.
- Availability of the tools required.
- Implementation by the Hosting institution of proper conditions to set up and integrate the Chair and the project within its teams and research structures.

#### 3/ IMPACTS

- Scientific impact of the proposal and possible impact in an economic, social or cultural context.
- Result dissemination and exploitation strategy.
- Contribution to the French and international scientific community.
- Relevance of the expected results as a basis for proposal submission to the ERC Advanced (or Consolidator, or Synergy), a programme to find new funding to support the Chair,

- Ensuring the continued excellence within the hosting facility: capacity to commit and criteria to be implemented by the institution to secure the successful applicant position and his/her environment, at the end of the 5-year chair.

## 4. General provisions for funding

## 4.1. Funding

This call has a total €80 million budget.

Eligible expenses are specified in the financial regulation of the call for proposals, available on the ANR website.

The breakdown of the funding allocated throughout the project is detailed in the funding agreement drawn up by the ANR. Funding may only be granted to higher education institutions (public or private and non-profit), research institutions or umbrella organisations with the authority to act as a legal person, as well as health care institutions (public or private and non-profit).

Companies and non-profit higher education institutions may act as partner institutions but will not receive any funding as part of proposal funding.

The funds will be paid to the Coordinating institution.

These Chairs may receive funding up to €2 million (including the salary of the recipient if he/she does not hold a permanent position). Additional funding up to €1 million, intended for the purchase and operation (including staff) of massive and critical equipment for the project, unavailable in the host laboratory nor on its site, may be exceptionally requested.

For a researcher working abroad, this additional funding may be increased (to a maximum of €3 million) to encourage his/her establishment in France and help fund massive equipment that is unavailable and their specific operation (including staff).

## 4.2. Consortium agreements

Partnership-based funded projects must enter into a Consortium Agreement (within 12 months from the notification of the funding agreement) specifying the rights and obligations of each partner institution involved in the project. This agreement specifies:

- The breakdown of the financial allocation, tasks and deliverables between the different partners, as well as the human and financial resources mobilised by the latter,
- The scientific, technical and financial terms to access the resources shared between the partners,
- The terms to exploit the research results and shared intellectual and industrial property.

## 4.3. Open Science

As part of the ANR's contribution to the promotion and implementation of Open Science, and in line with the French National Plan for Open Science (NPOS) and International Plan S, recipients of the France 2030 grant undertake to ensure immediate open access to peer-reviewed scientific publications and to adopt, for research data, a FAIR (Findable, Accessible, Interoperable, Reusable) approach in line with the "as open as possible and as closed as necessary" principle. Thus, all scientific publications from projects funded within the framework of this plan will be available in open access, under the Creative Commons CC-BY

license or equivalent, using one of the three following methods:

- publication in a natively open access journal,
- publication in a subscription journal that is part of a transformative agreement or transformative journal<sup>1</sup>,
- publication in a subscription journal. The publisher's version or the manuscript accepted for publication will be deposited in the Open archive HAL by its authors, under a CC-BY license, implementing the Rights Retention Strategy (RRS), according to the terms specified in the Special Conditions of the Funding Decision or Agreement.

Furthermore, the Coordinating Institution undertakes to ensure that the full version of these scientific publications (version approved for publication or publisher's version) is deposited in the national Open archive HAL, no later than the time of publication, and to mention the ANR reference of the research project from which they result.

The ANR encourages the deposit of pre-prints in open platforms or archives, and to prefer permanent or unique login details (e.g., DOI or HAL Id). In addition, the ANR recommends that priority be given to publications in natively open access journals or books<sup>2</sup>.

Finally, the Coordinating Institution agrees to provide, within 6 months after the start of the project, a first version of the Data Management Plan (DMP), under the terms and conditions set out in the Grant Agreement.

#### 4.4. State aid

The aid granted under this call for proposals is subject to the European regulation on State aid (Articles 107, 108 and 109 of the Treaty on the Functioning of the European Union and related texts) insofar as it qualifies as State aid. Therefore, such funding must comply with the European regulation on State Aid and fall within the Commission Regulation (EU) No. 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty.

## 5. Application process

## 5.1. Content of the letter of intent

During stage 1, the application includes:

- The letter of intent, including the detailed *curriculum vitae* of the applicant, a presentation of the host laboratory and a brief description of the scientific proposal.
- A commitment letter from the host institution,
- An appendix including the list of 10 major publications.

## 5.2. Content of the full proposal

During stage 2, the application includes:

- The administrative information regarding the proposal, entered directly through the dedicated online data-entry interface,
- A document giving a detailed description of the research proposal,
- A scientific appendix,
- A financial appendix.

<sup>&</sup>lt;sup>1</sup> Definition of a <u>transformative agreement</u> or <u>transformative journal</u>: <u>https://www.coalition-s.org/faqtheme/publication-fees-costs-prices-business-models/</u>

<sup>2</sup> The DOAJ website (https://doaj.org/) lists peer-reviewed open access scientific journals. The same applies to the DOAB website (https://www.doabooks.org/) but with monographs.

#### **IMPORTANT**

No additional element will be accepted after the closing for the submission of the call for proposals, for a specific round whose date and time are listed in page 3.

The templates to be used to put together an application for each phase (letter of intent, scientific document, appendices and commitment letter in Word format; administrative and financial document in Excel format) will be available on the publication web page of this call for proposals (see URL in page 1).

As proposals are evaluated by an international panel, it is advised to submit a scientific and technical description of the project in English. If the proposal is written in French, an English translation may be required, within a timeframe consistent with the deadline of the evaluation process.

## 5.3. Submission procedure

Applications must be submitted IN ELECTRONIC FORMAT:

- Before the closing date of a given round (see page 3),
- On the submission website, as previously recommended.

The SIGNED AND SCANNED versions of each section of the financial appendix and commitment letter of the hosting institution must be uploaded on the submission website.

The electronic upload is the only version to be provided to the reviewers to review the applications.

The proposals that do not meet the admissibility criteria will not be submitted to the panel and will in no way be eligible for funding.

### 5.4. Submission advice

It is strongly advised to:

- Open an account on the submission website at the earliest,
- Not wait until the deadline for submission of proposals to enter data online and upload files (please note that the submission deadline must be respected),
- Check that the documents submitted in the dedicated areas under the headings "submission documents" and "signed documents" are complete and consistent with the expected elements. The application and submission of signed documents can only be approved by the scientific and technical project manager if all the documents have been uploaded,
- Regularly consult the dedicated website fo the call for proposals at the address listed in page 1, which includes up-to-date information on its operation,
- Contact, if necessary, the correspondents by email at the address listed in page 3 of this document.

## Appendix 1: Areas (from the ERC) open to the call for proposals

#### LS1 Molecules of Life: Biological Mechanisms, Structures and Functions

For all organisms:

Molecular biology, biochemistry, structural biology, molecular biophysics, synthetic and chemical biology, drug design, innovative methods and modelling

LS1\_1 Macromolecular complexes including interactions involving nucleic acids, proteins, lipids and carbohydrates

LS1\_2 Biochemistry

LS1\_3 DNA and RNA biology

LS1\_4 Protein biology

LS1 5 Lipid biology

LS1\_6 Glycobiology

LS1\_7 Molecular biophysics, biomechanics, bioenergetics

LS1\_8 Structural biology

LS1\_9 Molecular mechanisms of signalling processes

LS1 10 Synthetic biology

LS1\_11 Chemical biology

LS1\_12 Protein design

LS1\_13 Early translational research and drug design

LS1\_14 Innovative methods and modelling in molecular, structural and synthetic biology

#### LS2 Integrative Biology: from Genes and Genomes to Systems

For all organisms:

Genetics, epigenetics, genomics and other 'omics studies, bioinformatics, systems biology, genetic diseases, gene editing, innovative methods and modelling, 'omics for personalised medicine

LS2\_1 Genetics

LS2\_2 Gene editing

LS2\_3 Epigenetics

LS2\_4 Gene regulation

LS2\_5 Genomics

LS2 6 Metagenomics

LS2\_7 Transcriptomics

LS2\_8 Proteomics

LS2 9 Metabolomics

LS2\_10 Glycomics/Lipidomics

LS2\_11 Bioinformatics and computational biology

LS2\_12 Biostatistics

LS2\_13 Systems biology

LS2\_14 Genetic diseases

LS2\_15 Integrative biology for personalised medicine

LS2\_16 Innovative methods and modelling in integrative biology

#### LS3 Cellular, Developmental and Regenerative Biology

For all organisms:

Structure and function of the cell, cell-cell communication, embryogenesis, tissue differentiation, organogenesis, growth, development, evolution of development, organoids, stem cells, regeneration, therapeutic approaches

LS3 1 Cell cycle, cell division and growth

LS3\_2 Cell senescence, cell death, autophagy, cell ageing

LS3\_3 Cell behaviour, including control of cell shape, cell migration

LS3 4 Cell junctions, cell adhesion, the extracellular matrix, cell communication

LS3\_5 Cell signalling and signal transduction, exosome biology

LS3\_6 Organelle biology and trafficking

LS3\_7 Mechanobiology of cells, tissues and organs

LS3\_8 Embryogenesis, pattern formation, morphogenesis

- LS3\_9 Cell differentiation, formation of tissues and organs
- LS3 10 Developmental genetics
- LS3\_11 Evolution of developmental strategies
- LS3\_12 Organoids
- LS3\_13 Stem cells
- LS3\_14 Regeneration
- LS3\_15 Development of cell-based therapeutic approaches for tissue regeneration
- LS3\_16 Functional imaging of cells and tissues
- LS3\_17 Theoretical modelling in cellular, developmental and regenerative biology

#### LS4 Physiology in Health, Disease and Ageing

Organ and tissue physiology, comparative physiology, physiology of ageing, pathophysiology, inter-organ and tissue communication, endocrinology, nutrition, metabolism, interaction with the microbiome, non-communicable diseases including cancer (and except disorders of the nervous system and immunity-related diseases)

- LS4\_1 Organ and tissue physiology and pathophysiology
- LS4\_2 Comparative physiology
- LS4\_3 Physiology of ageing
- LS4 4 Endocrinology
- LS4\_5 Non-hormonal mechanisms of inter-organ and tissue communication
- LS4\_6 Microbiome and host physiology
- LS4\_7 Nutrition and exercise physiology
- LS4\_8 Impact of stress (including environmental stress) on physiology
- LS4\_9 Metabolism and metabolic disorders, including diabetes and obesity
- LS4\_10 The cardiovascular system and cardiovascular diseases
- LS4\_11 Haematopoiesis and blood diseases
- LS4 12 Cancer
- LS4\_13 Other non-communicable diseases (except disorders of the nervous system and immunity-related diseases)

#### LS5 Neuroscience and Disorders of the Nervous System

Nervous system development, homeostasis and ageing, nervous system function and dysfunction, systems neuroscience and modelling, biological basis of cognitive processes and of behaviour, neurological and mental disorders

- LS5 1 Neuronal cells
- LS5\_2 Glial cells and neuronal-glial communication
- LS5\_3 Neural development and related disorders
- LS5 4 Neural stem cells
- LS5\_5 Neural networks and plasticity
- LS5\_6 Neurovascular biology and blood-brain barrier
- LS5\_7 Sensory systems, sensation and perception, including pain
- LS5\_8 Neural basis of behaviour
- LS5\_9 Neural basis of cognition
- LS5 10 Ageing of the nervous system
- LS5\_11 Neurological and neurodegenerative disorders
- LS5\_12 Mental disorders
- LS5 13 Nervous system injuries and trauma, stroke
- LS5\_14 Repair and regeneration of the nervous system
- LS5\_15 Neuroimmunology, neuroinflammation
- LS5\_16 Systems and computational neuroscience
- LS5\_17 Imaging in neuroscience
- LS5 18 Innovative methods and tools for neuroscience

#### LS6 Immunity, Infection and Immunotherapy

The immune system, related disorders and their mechanisms, biology of infectious agents and infection, biological basis of prevention and treatment of infectious diseases, innovative immunological tools and approaches, including therapies

LS6\_1 Innate immunity

LS6\_2 Adaptive immunity

- LS6\_3 Regulation of the immune response
- LS6 4 Immune-related diseases
- LS6\_5 Biology of pathogens (e.g., bacteria, viruses, parasites, fungi)
- LS6\_6 Infectious diseases
- LS6\_7 Mechanisms of infection
- LS6\_8 Biological basis of prevention and treatment of infection
- LS6\_9 Antimicrobials, antimicrobial resistance
- LS6\_10 Vaccine development
- LS6\_11 Innovative immunological tools and approaches, including therapies

#### LS7 Prevention, Diagnosis and Treatment of Human Diseases

Medical technologies and tools for prevention, diagnosis and treatment of human diseases, therapeutic approaches and interventions, pharmacology, preventative medicine, epidemiology and public health, digital medicine

- LS7\_1 Medical imaging for prevention, diagnosis and monitoring of diseases
- LS7\_2 Medical technologies and tools (including genetic tools and biomarkers) for prevention, diagnosis, monitoring and treatment of diseases
- LS7\_3 Nanomedicine
- LS7 4 Regenerative medicine
- LS7\_5 Applied gene, cell and immune therapies
- LS7\_6 Other medical therapeutic interventions, including transplantation
- LS7\_7 Pharmacology and toxicology
- LS7\_8 Effectiveness of interventions, including resistance to therapies
- LS7\_9 Public health and epidemiology
- LS7\_10 Preventative and prognostic medicine
- LS7\_11 Environmental health, occupational medicine
- LS7\_12 Health care, including care for the ageing population
- LS7 13 Palliative medicine
- LS7\_14 Digital medicine, e-medicine, medical applications of artificial intelligence
- LS7\_15 Medical ethics

#### LS9 (partial) Biotechnology and Biosystems Engineering

Biotechnology using all organisms, biotechnology for environment and food applications, applied plant and animal sciences, bioengineering and synthetic biology, biomass and biofuels, biohazards

- LS9\_1 Bioengineering for synthetic and chemical biology
- LS9\_2 Applied genetics, gene editing and transgenic organisms
- LS9\_3 Bioengineering of cells, tissues, organs and organisms
- LS9\_4 Microbial biotechnology and bioengineering
- LS9\_5 Food biotechnology and bioengineering
- LS9\_6 Marine biotechnology and bioengineering



