EU. Participation of small and medium-sized enterprises (SMEs)[393] is encouraged with the aim to strengthen the scientific and technological basis of SMEs and valorise their health innovations.

Proposals should apply good practices for GDPR[394] compliant personal data protection.

Proposals are encouraged, where relevant, to exploit the available data services, expertise and digital tools offered by the relevant European research infrastructures [395] and/or data infrastructures[396] in the area of health funded under the Digital Europe Programme.

All proposals selected for funding under this topic will be strongly encouraged to participate in networking and joint activities (e.g. participation in joint workshops, development of best practices, or joint communication activities), which may also involve networking with projects funded under Horizon Europe, or other EU programmes (e.g. the Digital Europe Programme[397]). The proposals should allocate a sufficient budget for networking and joint activities, without the prerequisite to detail such activities at the proposal stage.

Applicants should provide details of their clinical studies[398] in the dedicated annex using the template provided in the submission system. As proposals under this topic are expected to include clinical studies, the use of the template is strongly encouraged.

HORIZON-HLTH-2027-03-TOOL-02: Advancing bio-printing of living cells for regenerative medicine

Call: Cluster 1 - Health (Single stage - 2027/2)	
Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of between EUR 7.00 and 10.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 39.30 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply:

393 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003H0361

394 General Data Protection Regulation: https://commission.europa.eu/law/law-topic/data-protection_en, https://gdpr-info.eu

395 The catalogue of European Strategy Forum on Research Infrastructures (ESFRI) research infrastructures portfolio can be browsed on the ESFRI website: https://ri-portfolio.esfri.eu

396 https://digital-strategy.ec.europa.eu/en/policies/artificial-intelligence-health

397 https://digital-strategy.ec.europa.eu/en/activities/digital-programme

398 Please note that the definition of clinical studies (see introduction to this Work Programme part) is broad and it is recommended that you review it thoroughly before submitting your application.

	In recognition of the opening of the US National Institutes of Health's programmes to European researchers, any legal entity established in the United States of America is eligible to receive Union funding. If projects use satellite-based earth observation, positioning, navigation and/or related timing data and services, beneficiaries must make use of Copernicus and/or Galileo/EGNOS (other data and services may additionally be used). The Joint Research Centre (JRC) may participate as member of the consortium selected for funding as a beneficiary with zero funding, or as an associated partner. The JRC will not participate in the preparation and submission of the proposal - see General Annex B.
Award criteria	The criteria are described in General Annex D. The following exceptions apply: The thresholds for each criterion will be 4 (Excellence), 4 (Impact) and 4 (Implementation). The cumulative threshold will be 12.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: The granting authority may, up to 4 years after the end of the action, object to a transfer of ownership or to the exclusive licensing of results, as set out in the specific provision of Annex 5.

Expected Outcome: This topic aims at supporting activities that are enabling or contributing to one or several expected impacts of destination "Developing and using new tools, technologies and digital solutions for a healthy society". To that end, proposals under this topic should aim to deliver results that are directed at, tailored towards and contributing to most of the following expected outcomes:

- Biomedical scientists from academia and industry will gain access to entire bio-printing units designed to regenerate human tissue.
- Healthcare professionals acquire information on the safe and effective use of equipment enabling advanced therapies with bio-printed human tissue.
- Healthcare providers dispose of tools enabling them to treat conditions of unmet medical need.
- Individual patients will benefit from a personalised approach to their respective medical condition thanks to the bio-printed regenerative medicine solution.

Scope: Tissue-specific functional 3D bio-printing of living cells has made significant progress as a new approach for transplantation applications in regenerative medicine. There are currently several types of bio-printing technologies under development for the repair of different targeted tissues or organs. To fully unleash the potential of bio-printed cell constructs for regenerative

medicine several bottlenecks still need to be overcome. Various studies in pre-clinical models have shown that bio-printed cell constructs or tissues hold great promise for regenerative medicine, by allowing autologous tissue grafts being printed thus avoiding adverse graft-host reactions. However, translation of such approaches into clinical settings (i.e. humans) and their application to internal organs still needs to be investigated and demonstrated. Dependant on the actual target site (i.e. the defect tissue or organ in the human body) different bio-printing approaches may be preferable. For printing complex tissues and especially entire organs an in-vitro approach followed by transplantation is the preferred way. "In-situ" bio-printing, sometimes also referred to as "in-vivo", or as "intraoperative", reflects a bioprinting process performed on a live subject in a surgical setting and has in certain instances (e.g. tissue repair) advantages over an in-vitro bio-printing technique followed by transplantation. In-situ bio-printing involves direct patterning of bio-inks onto a patient's body at the target site, allowing for precise construction of a site-matching tissue-structure within the actual physiological location where regeneration or repair is needed. As such, in-situ bio-printing allows for high adaptability, reduced risk of contamination, improved cell viability, function and host integration. The high cell densities present in the human vital organs underscore the importance of bio-inks which contain less additional biomaterials as matrix. Hence the bio-printing of cell constructs that comprise native tissue-like cell densities may facilitate repair and/or regeneration of defective complex tissues or internal organs. For such approaches meticulous engineering of the bio-printing equipment is necessary, involving sophisticated micro-surgical instrumentation and medical imaging platforms. To achieve the desired function and to mimic the natural cues in native tissues for in-vitro printed bio-constructs, the use of additional stimuli is needed, whereas in-situ approaches normally rely on the body as natural bioreactor providing the necessary extracellular cues. Recently, combinations of in-situ bio-printing with real-time stimuli have been investigated, even for the repair of internal organs. However, there remain bottlenecks that need to be overcome, like the integration with existing imaging modalities and surgical procedures or the long-time stability and functionality of the created bio-constructs.

To address these challenges, researchers should work in multidisciplinary teams with engineers, biomedical scientists, cell biologists and medical doctors. Proposals should be based on the use of human cells and address all the following activities:

- Develop or improve existing bioprinting equipment that comprises all steps of the bio-printing suite to print bio-constructs with high cell-density for improved vascularisation and faster repair of the defect in the body.

- Scale-up the chosen bio-printing technology to a Good Manufacturing Practices (GMP)[399] conform/compliant manufacturing process.

- Perform all necessary regulatory work enabling the conduct of clinical studies and assess the clinical value of the developed bio-printing technology in first in-human studies.

[399] https://health.ec.europa.eu/medicinal-products/eudralex/eudralex-volume-4_en