



BESLUT

Datum för beslut:  
2025-04-03

Diarienummer:  
KTH-RPROJ-0276016

## Beslut om ett strategiskt forskningsinitiativ, KTH IMPreT - In vitro Models for Precision Therapies

Detta beslut har undertecknats elektroniskt.

### Beslutet

KTH:s vicerektor för forskning beslutar att:

- Finansiera *KTH IMPreT - In vitro Models for Precision Therapies* med 1 mnkr centrala medel under 2025.
- Utse Anna Herland, CBH-skolan, som ansvarig forskningsledare för satsningen.
- Återrapportering enligt utvärderingskriterier, för dialog om fortsatt bidrag ska vara Forskningsberedningen tillhanda 13 april 2026.

### Ärendet

KTH:s initiativ för forskningssatsningar inrättades enligt förslag från Översyn av KTH:s särskilda forskningssatsningar (Dnr: KTH-RPROJ-0276016). Förslaget innebär att centrala medel ska kunna användas till direkt finansiering av tre- till femåriga forskningsinitiativ med det huvudsakliga målet att dra in externa forskningsanslag.

Under föregående år har Forskningsberedningen arbetat vidare med att konkretisera förslaget, och kommit fram till ett antal kriterier för ett KTH Strategiskt initiativ samt kriterier för utvärdering (Protokoll 10/2024):

*Kriterier för KTH Strategiskt forskningsinitiativ:*

- Strategiska forskningsinitiativ är ett sätt för KTH att kraftsamla inom områden där det krävs nya samarbeten som är viktiga utifrån KTH:s vision och mål. Det kan dels vara att förstärka ett område som redan finns eller utveckla ett nytt.
- Strategiska forskningsinitiativ ska kunna initieras av både forskare, KTH:s ledning och forskningsberedningen.
- Strategiska forskningsinitiativ är satsningar med central finansiering på 0,5 - 3 mnkr per år i max fem år.
- Målsättningen för en beviljad satsning är att generera betydande externa bidrag till KTH om totalt minst 100 mnkr. Det kan vara externa bidrag från flera olika finansiärer som

tillsammans stärker området för forskningsinitiativet. Utväxlingen blir den viktigaste indikatorn som följs upp årligen.

*Kriterier för utvärdering av beviljat KTH Strategiskt forskningsinitiativ ska ske efter ett år enligt nedan:*

- Projektansökan – En eller flera projektansökningar.
- Kraftsamling - Vilka PI' s är med i projektansökan/ansökningar?
- Förberedelsearbete inför utlysningar.
- Exempel på nya forskningssamarbeten.

Dessutom kommer behov av central finansiering, budgetutrymme och strategisk relevans att vägas in vid Forskningsberedningens bedömning.

Till Forskningsberedningens möte den 26 mars inkom förslaget KTH IMPreT - In vitro Models for Precision Therapies, med professor Anna Herland, CBH-skolan, som ansvarig forskningsledare, se bilaga 1.

Baserat på Forskningsberedningens diskussion rekommenderas Vicerektor för forskning att stödja att förslaget beviljas sökt budget, 1 mnkr för år 2025. En utvärdering ska ligga till grund för diskussion om fortsatt finansiering och i vilken omfattning. (KTH-RPROJ-0276016 Protokoll 10/2024).

**Detta beslut** har fattats av vicerektor för forskning Annika Borgenstam efter föredragning av forskningsrådgivare Johan Schuber.

Kungl. Tekniska högskolan



Annika Borgenstam, vicerektor för forskning KTH



Johan Schuber, forskningsrådgivare, avdelningen för forskningsstöd inom Verksamhetsstödet

Bilaga 1: projektförslag

## Sändlista

### För åtgärd:

Anna Herland, CBH-skolan

### Kopia till:

Skolchef CBH-skolan

Controllergruppen, [controller@kth.se](mailto:controller@kth.se)

Chefen för avdelningen för forskningsstöd Maria Gustafson

Tf Kommunikationschef Gunilla Iverfelt

Anna Aminoff

Sanna Pehrson, avdelningen för forskningsstöd

### Expeditionsdatum:

2025-04-03



## KTH Strategic Research Initiative IMPreT - *In vitro* Models for Precision Therapies

### TEAM (CVs attached in links for each name)

PI, [Anna Herland](#), Professor, CBH

#### co-PIs

[Fredrik Edfors](#), Assistant Professor, CBH

[My Hedhammar](#), Professor, CBH

[Joakim Jaldén](#), Professor, EECS

[Tuuli Lappalainen](#), Professor, CBH

[Joakim Lundeberg](#), Professor, CBH

[Cecilia Williams](#), Professor, CBH

[Thomas Winkler](#), Associate Professor, EECS

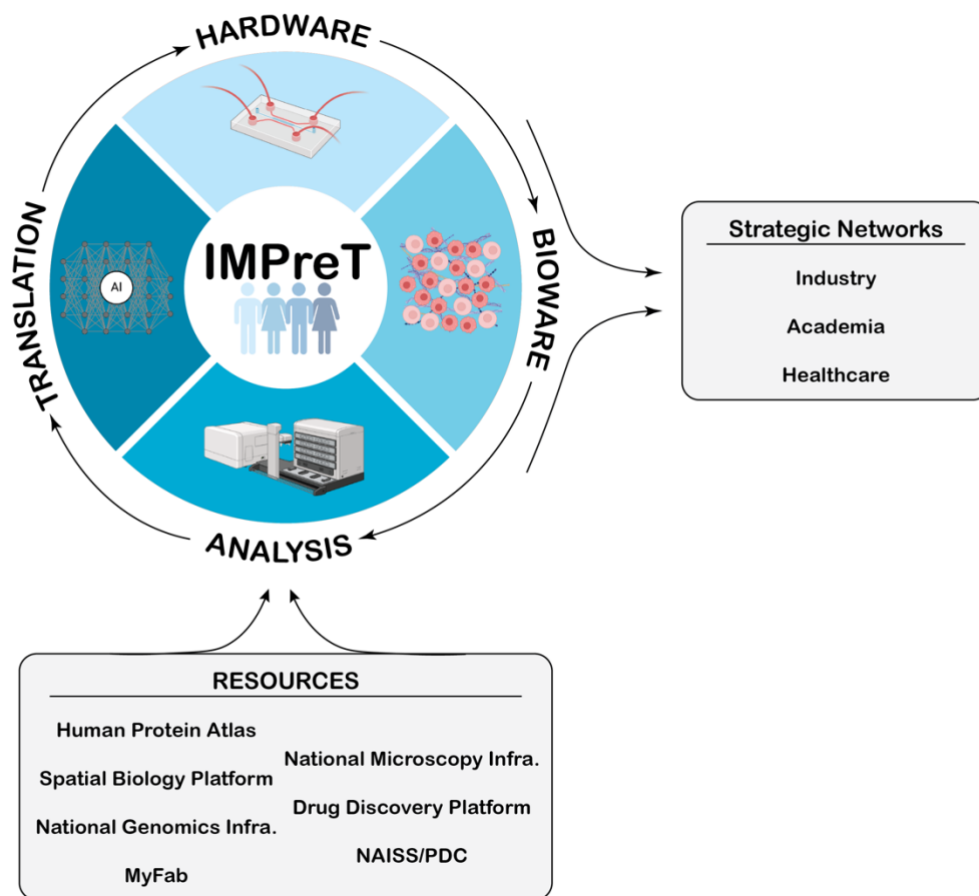
[Björn Önfelt](#), Professor, SCI

### Coordinator

[Inês Pinto](#), Researcher, CBH

**Funding**, total direct funding requested, 3 MSEK/year for 5 years - total 15 MSEK

**Revised request, first year 1 MSEK.**



**Figure 1** Overview of the integration and development technical areas needed to realize IMPreT at KTH, including relevant stakeholder networks and infrastructure resources on which the initiative would lay its foundation.



## Purpose

Sweden has an excellent research infrastructure in Life Science research, mainly via SciLifeLab, strongly mediated by KTH. Today, we also have research programs such as DDLS and WASP that enable us to take the lead in big data analysis and interpretation towards precision medicine. However, Sweden currently lacks a coordinated research focus on the foundational technology development and integration of human-relevant *in vitro* models. Human-relevant models are needed for systematic studies and validation to transition from big data generation to advance new biological insights and therapeutics. Leveraging our core strengths at KTH, we aim to form an excellence cluster in emerging technologies to address this need.

The strategic initiative IMPreT will join world-leading competencies within three of KTH's schools to develop **novel technologies for the generation of advanced human in vitro models** (i.e., complex multicellular systems such as organoids and organ-on-chip). Our vision is to become the Swedish hub for **developing** and **providing** *in vitro* technologies that can be applied in precision medicine in clinical practice and as tools for the pharmaceutical industry to benefit the region and the whole country. Complex multicellular systems have significantly transformed *in vitro* biomedical research by offering insights into previously inaccessible human development and disease processes. However, to propel this to the next level, technological improvements are urgently needed to enable 1) better mimicry of the cellular microenvironment, 2) reproducible assays with advanced spatial readout, and 3) methods, including AI, to interpret and translate complex multicellular data. IMPreT will address these key points through multidisciplinary skills within KTH and partnering with academic groups, infrastructures, clinicians, and industry. **We thus seek to establish a center of excellence for emerging technologies with holistic pipelines for ground-breaking technology for model generation, analysis, and data translation that can be applied to any organ and disease, eventually provided as a national infrastructure.**

### *How will IMPreT strengthen KTH and contribute to fulfill KTH's vision and goals?*

IMPreT ensures that KTH, and by extension, Sweden, will establish an internationally leading position within advanced *in vitro* systems. Our placement in the intersection of cutting-edge technology development and life sciences insights gives us a distinctive lead. Our proposal is unique for six reasons that directly synergize with KTH strengths and activities: 1) our technologies for establishing advanced multicellular systems, including relevant spatial tissue microenvironments; 2) our technologies for providing physiological culture conditions, including perfusion of vasculature; 3) our exceptional development of analytical tools for precision medicine; 4) our technologies for detailed spatial evaluation of multicellular systems, including spatial transcriptomics and proteomics; 5) our hosting of the Human Protein Atlas, one of the world's largest atlases of tissue and cell protein expression; 6) our knowledge of AI-based tools to handle multidimensional molecular and image data. Additionally, by partnering with clinical trials, the pharma industry, and infrastructures for drug discovery, IMPreT will advance models for drug testing, marking a significant step toward functional precision medicine.

IMPreT builds on KTH's forefront research areas in *hardware development* using micro/nanotechnologies and robotics/automation, *molecular life science* in tailored molecular development and evaluation methods, as well as *AI and machine learning* for evaluation and translation to human outcomes. We will address the pressing global problem of providing sustainable technologies that can enable true precision medicine on a personalized level. Our personalized approach harmonizes with KTH's vision of a more equal society. IMPreT is perfectly aligned with KTH's goals of interdisciplinary approaches and collaboration with leading universities (Hubrecht Institute, Karolinska Inst, Harvard University, ...), industry (CellInk, AstraZeneca, Alligator Bioscience, Affibody, Pixelgen, ...), and societal stakeholders such as Region Stockholm.

### *How is IMPreT related to societal / industrial / educational needs?*

During the last 15 years, the EU has increasingly introduced legislation to reduce, refine, and replace (3R) animals in science<sup>1</sup>, including pharmaceutical testing. In late 2022, the USA altered its legislation with the FDA Modernization Act 2.0, authorizing the use of alternatives to animal testing, including cell-based assays and

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<sup>1</sup> <https://www.ema.europa.eu/en/human-regulatory-overview/research-development/ethical-use-animals-medicine-testing>



computer models, to investigate the safety and effectiveness of a drug. These legislation changes, along with the rise of personalized medicines, demonstrate the societal need for improved *in vitro* models. The timeliness of our proposal is further evident in our alignment with multiple of VINNOVA's "Strategic Technologies for Sweden"<sup>2</sup> (Biotechnology for Health, AI, and Materials) as well as VR's upcoming focus on technology for life sciences, and especially the government's major effort on Centers of Excellence in emerging technologies (Forskningspropositionen). We intend to build a collaborative bridge not only between cross-disciplinary research areas but also between academia and industrial and clinical partners. Besides the inherent collaborative research efforts, IMPreT will foster a new generation of students and independent scientists equipped with interdisciplinary know-how and innovative tools. All team participants are active in KTH education at all levels including life-long learning where the concepts of IMPreT technologies can be introduced. Furthermore, IMPreT will serve as an open-access infrastructure hub that will democratize cutting-edge research tools and data, making them available to a wider scientific audience and facilitating a collaborative environment that encourages the sharing of knowledge and resources.

#### **Why at KTH – IMPreT synergies with KTH's strengths and infrastructures**

IMPreT represents a new collaboration initiative for the multidisciplinary team assembled to address the needs of establishing complex multicellular systems. Our combined team already has strong track records in all scientific disciplines needed to develop technology for improving *in vitro* model generation and analysis. IMPreT outlines research activities with strong synergy, but no overlap, with current research in DDLS and WASP, and in particular with several KTH (and national) infrastructures (see Fig 1):

[The Human Protein Atlas](#) and Human Disease Atlas can provide human reference data.

[Spatial Biology Platform](#) can assist with analysis. It is also an excellent example of how world-renowned Life Science technology (pioneered by team member Lundeborg) has now developed into an infrastructure.

[The National Genomics Infrastructure](#) can assist with analysis.

[The National Microscopy Infrastructure](#) can provide instrumentation for analysis.

[The Drug Discovery and Development Platform](#) can be a pilot tester and supply candidate drugs.

[MyFab](#) offers micro- and nanostructuring to create hardware, including chips and sensors.

[NAISS](#) (and PCD locally at KTH) can provide computational capacity.

#### **Competition to IMPreT**

The organoid and organ-on-chip field has seen remarkable growth in the last five years. Numerous academic groups in Sweden have established specific organoid models, and a few groups have developed microfluidic-based organ-on-chip models. Yet there is no hub that can lead the major advances in technology developments needed to enable a paradigm in the implementation of multicellular systems in industry and clinics. IMPreT has an excellent opportunity to take a leading role in providing the next generation of tools needed for more robust, standardized experimental and analytical tools for multicellular systems. In 2024, SSF funded a center for multicellular systems coordinated by Uppsala University, [CNSX3](#). Unlike IMPreT's holistic and pan-organ vision, this work is only focused on CNS and organoids. Internationally, IMPreT would be on par with centers of excellence in multicellular systems, such as [Hubrecht Institute](#) established by Prof. Clevers, [hDMT](#) in the Netherlands, [NCATS](#) in the USA, [Institute of Human Biology](#) established by Roche, or [Wyss Institute at Harvard](#). IMPreT would profile itself as a strong technology developer in the field. Herland and other IMPreT team members also keep continuous contact with the team for *in vitro* assay development at larger pharmaceutical companies, including AstraZeneca, Novo Nordisk, and Genentech. Herland, Winkler, and other IMPreT team members are further active in international societies and standardization efforts for *in vitro* models.

#### **Research team**

The IMPreT team is represented by excellent competence in the four key areas (Fig. 1) needed to establish an international leading hub for *in vitro* modeling. Inclusiveness is central to the initiative, and as IMPreT grows at

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<sup>2</sup> <https://www.vinnova.se/contentassets/f7d33a184cde48e6917e888d10c2836c/2024-01501-slutrapport-viktiga-tekniker-for-sverige.pdf>



KTH, researchers with complementary expertise will be brought into the center. Relevant additional disciplines include material science, automation, embedded systems, virtual testing/twins, and drug development.

Core competencies with links to short CVs and key publications (see top page)

- **Hardware:** Microsystems, microfluidics, and microsensor integration for cellular systems and culture Herland, Winkler, Önfelt
- **Bioware:** Multicellular cultures, organoids, primary cells, and stem cells, Herland, Önfelt, Hedhammar, Williams; Engineering of structural protein support for multicellular systems, Hedhammar; Animal reference material, Williams
- **Analysis:** Genomics, Lappalainen; Spatial transcriptomics, Lundeborg; Spatial proteomics, Edfors, Williams, Lundeborg; Imaging of cell structures, Önfelt, Jalden
- **Translation:** Machine learning/AI of multidimensional data, Jalden, Edfors, Lundeborg; in vitro-to-in vivo extrapolation, Herland

#### **Strategy for funding**

IMPreT is excellently positioned to target both interdisciplinary and focused grants, from basic science and translational calls at national and international levels to infrastructure and excellence cluster grants.

#### International grants

- **Horizon Europe, IHI,** Focus on Cluster I “Health” and Innovation grants
- Private foundations, e.g., Novo Nordisk, Chan Zuckerberg Initiative, Thun, Wellcome Leap

#### National grants

- Government Research Budget 2025-2028, IMPreT targets **Swedish Research Council** increased funding for Excellenscenter 625 MSEK, Excellenskluster 1 520 MSEK, Life Science Precisionsmedicin 275 MSEK, Infrastructure 150 MSEK and **Vinnova** funding “Excellenscenter inom banbrytande Teknik” 1 130 MSEK, “Program för Avancerad Life Science”, 278 MSEK
- Private foundations in health, technology, and innovation including KAW, Cancerfonden, Barncancerfonden, Sjöbergstiftelsen, Hjärnfonden, Erling Perssons Stiftelse

#### Strategic Research Areas

- The government research budget allocates 92.5 MSEK (2027-2028) to the SRA/SFO *Health, Life Science, and AI*, for which our center and network would be competitive.



### **Activities and budget.**

KTH strategic funding is essential to initiate the IMPreT initiative. In the startup phase, we will focus on internal and external networking, as well as the coordination of technologies and grant opportunities. We will establish the IMPreT brand and expand our already broad network of industrial, academic, and clinical collaborations. With the acquisition of external funding, the initiative will enable long-term competence and technology development, including recruitment of faculty, researchers, and students, and new educational activities in all cycles, including life-long learning activities. From the 5-10 yrs perspective, IMPreT will be an international key player in developing in vitro models and a national infrastructure that will provide a holistic pipeline of personalized in vitro models.

We have identified the need to engage a senior researcher to enable efficient coordination of these activities. The person will focus on identifying clinical/industrial needs and research synergies within the scope of IMPreT's core expertise. Dr. *Inês Pinto* is suggested based on previous experience in research and technical development with clinicians and industry, multi-dimensional data handling and grant writing.

*Here, we present a revised budget – adjusted to 1 MSEK in the first year.*

*Phase I (Year 1, 1 MSEK/yr)* – Overall activities: start-up, coordination, communication, branding and PR, organization of events, meet-ups, planning and writing of proposals, pilot data coordination.

Key activities, including budgeted costs in the form of team member activity, KTH communication support, or present KTH researcher activity.

#### **1. Establishing the IMPreT network and attracting more researchers and stakeholders**

*Total budget cost: 330 000 SEK*

*Coordination: Anna Herland, with the assistance of Inês Pinto (50 000 SEK)*

- Build a strong brand, online presence (establish a webpage with KTH partners), and communication strategy (co-funded and KTH communication support)
- Attract KTH researchers with complementary research areas via four internal meetings (total 30 000 SEK, co-funded)
- Coordination with other KTH Strategic Initiatives with extra focus on the coming calls for new SRAs (co-funded)
- Active Participation in international conferences, organization of European Organ Chip Society activities (co-funded)
- Network activities and targeted visits to identify stakeholder-specific needs and demands as well as identify co-applicants for national and international calls with the following segments:
  - 1) Clinicians
  - 2) Industry and research institutes
  - 3) Academical researchers – e.g. EU consortium building

#### **2. Hosting two open network workshops**

During the first year with presentations from KTH, clinical and industrial researchers. To prepare for upcoming SRA, Center and cluster formation, we suggest to have the first workshop late May 2025 and a second meeting in early October (Budget 250 000 SEK for venues, coffee, and lighter lunch)

#### **3. Grant Planning and preparation**

*Total budget cost: 670 000 SEK*

- salary cost Pinto 350 000 SEK (combined with network coordination above the equivalent of ~30% activity)
- distributed salary costs to PIs total 320 000 SEK to allocate time and incentivize strategic network activities, data preparation, and grant writing,
- professional illustrations 20 000 SEK





*Coordination: Inês Pinto, with the assistance of Anna Herland and all team members*

We will establish a detailed funding acquisition strategy targeting the funding sources listed above, as these calls have not yet been announced, and thus, the most suitable constellations can not be suggested.

- Identify synergies and participation in the calls for new SRA (SFOs) primarily in the Area “Health, life science och artificial intelligence”
- Grant writing targeting the following calls anticipated to be announced 2025/2026, we budget mainly for coordination and grant writing, but also professional illustrations
  - VR Excellenscenter, Excellenskluster “Life Science Precisionsmedicin”
  - **Vinnova** funding “Excellenscenter inom banbrytande Teknik”, “Program för Avancerad Life Science
  - KAW project of high scientific potential
  - We have identified the need for proof-of-concept data generation between PIs in the team and strategic partners to support these applications. We will focus on demonstrating the inter-platform compatibility for model generation, data acquisition, data analysis, and model validation. An example of such a pilot can be to create an improved physiological resemblance of tumor tissue by integrating the technologies from Hedhammar, Herland, Önfelt, and Winkler, improving data generation via technologies from Lundeborg, Lappalainen and improving data analysis via Jaldén’s methods. Data can then be evaluated against in vivo models from Williams and patient data from Edfors. This proof-of-concept data generation, which is co-funded by the team, will initially be done by coordinating a subset of the technologies. We will additionally evaluate synergies between our existing data.

Phase 2 (Year 2-5, 3 MSEK/yr + 5 MSEK in ext funding yr 3 ramping to 20 MSEK yr5 ) – Overall activities: larger networking events, coordination of proposals, 4-5 national external network grants/excellence cluster applications, 4-5 international research grants, initiation of educational activities.

Phase 3 (Year 5-10, 25 MSEK/yr in external funding) – Overall activities: Strategic recruitment, establishment of infrastructure, a KTH research community of >50 researchers.










# KTH internt beslut med e-signatur: kth-proj-0276016\_ KTH IMPreT - In vitro Models for Precision Therapies

Slutgiltig revideringsrapport

2025-04-03

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