IHI Call Days | Call 9 | SO-1

- **AgeMorbidity** : evaluating aging clocks and co-morbidity spectra of neurodegeneration & cardiometabolic diseases

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Link to the IHI brokerage platform:

- Proposal sharing tool : IHI Brokerage Platform
- Participant profile : Alpha Tom Kodamullil, IHI Brokerage Platform

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Challenges and objectives

Which IHI specific objective(s) are you addressing?

Topic 1 (SO1): contribute towards a better understanding of the determinants of health and priority disease areas.

What problem(s) are you trying to solve?

Aging and (co-)morbidities are the major risk factors for health. Current drug development is confronted with aspects of co-morbidity (individual risk) and individual, organ-specific aging clocks comparably late in drug development (e.g. when clinical trials are already planned). This can lead to “late” (and expensive) failure of drug development programs.

Which unmet public health need are you addressing?

Two indication areas: neurodegeneration and cardiometabolic diseases.

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Our approach to solve the problem

A systematic approach on **testing aging clocks and co-morbidity spectra** for **mechanism-based patient stratification** by :

- Collecting data and knowledge (semantic interoperability) with focus on representing indication area, co-morbidity spectra and aging-clock (Putting a focus on co-morbidity spectra, (healthy) aging and the role of microbiome / environment / nutrition/ socio-psychological aspects on drug development with neurodegeneration and cardiometabolic diseases as core indication areas)
- Learn environmental / behavioral / nutrition factors that have direct influence on endpoints relevant for drug development in neurodegeneration & cardiometabolic diseases
- Co-morbidity and aging clocks will be tested, qualified and developed in their role as determinants of stratification of patients and the patient path over age in general.
- Make use of generative AI approaches to generate synthetic data representing a good part of the observational space and integrating heterogeneous data
- Individualized predictions that take (organ-specific) aging clocks and co-morbidities into account and optimize drug development aspects for subgroups of patient defined by the above listed constraints

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Is your project suitable for IHI?

Explain why a public private collaboration is essential to develop your proposal?

- Biotech- and Pharma-Companies will be able to take comprehensive co-morbidity information into account much earlier in drug development.

Where do you see the contribution of industry in your proposal? Why do you require different health industry sectors?

- Collaboration among:
  - Patient Data Custodians (University Hospitals, Pharma companies)
  - Academia & Start-ups : research, validation & technical implementation of project
  - In-kind contributions (Industry)
  - Translation from research to therapeutic development (Biotech / Pharma companies)

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Outcomes and Impact

- Comprehensive overview on all data (study data, observational & population data) and all knowledge (disease- and co-morbidity- specific knowledge graphs) provides the ultimate foundation for AI approaches - AgeMorbidity will build on existing platforms - IMI-EHDEN
- Generation of synthetic data sets that integrate aging-clock information, nutrition and lifestyle factors and behavioral patterns as endpoint for drug development
- AI based Platform for testing and simulation of drug development optimization for subgroups of patient :
  - Personalized co-morbidity spectra
  - Personalized aging clocks / aging biomarkers
  - Mechanism-based strata of patient that take co-morbidity and aging into account at individual level
- AgeMorbidity will prepare for prevention (by assessing role of microbiome / environment / nutrition/ lifestyle and propose interceptions - eg; nutrition intervention)
- AgeMorbidity integrated information can be made useful for optimized trials

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Expertise and resources

- Fraunhofer Gesselschaft, Germany (76 institutes specialized in various fields)
  - Fraunhofer SCAI – Department of Bioinformatics
    - Prof. Dr. Martin Hofmann-Apitius (co-ordinator & partner of IHI, EU projects, Industrial Collaborations)
    - Prof. Dr. Holger Fröhlich (AI & Data Science, co-ordinator of IMI, IHI, EU industry projects)
    - Dr. Alpha Tom Kodamullil (Semantics & Knowledge Graph, partner of IHI, EU projects, Industrial Collaborations)
    - Jun-Prof. Dr. Marie-Christine Simon (Microbiome, metabolism, gut-brain-axis)
- We are looking for:
  - Patient / Data Custodians - Real-World Data and observational studies
  - in-kind contributions (IKOP* and IKAA** for Private members, cash or in-kind contributions
  - Any partner, who could contribute to the research aspect of the proposal

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