Complement -ARIE: Complement Animal Research In Experimentation

Challenge

Q & A Panel Discussion

December 6, 2023

Today's Agenda

- **Opening Remarks**

- **Background**

- **Complement-ARIE Challenge**
  - Overview
  - Timeline
  - Eligibility
  - Submission Process & Requirements
  - Evaluation Criteria
  - Challenge Site Demo

- **Live Q&A Session**

Please type questions you have throughout the webinar in the Q&A box

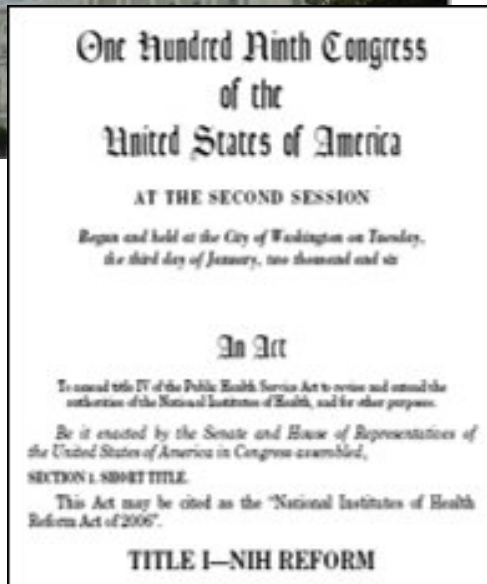Questions submitted via the Q&A box will be answered at the end of the presentation

Participants should remain muted

The webinar will be recorded and made publicly available

Common Fund Historical Perspective

2004: NIH Roadmap is launched

December 9, 2006: Congress unanimously reauthorizes the NIH

Establishes the Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI) within Office of the Director and the NIH Common Fund to provide a dedicated source of funding to enable *trans*-NIH research

The Common Fund Moves the NIH Mission Forward – Faster

Supporting bold scientific programs that **catalyze discovery** across all biomedical and behavioral research

Advances areas of biomedical and behavioral research important to the missions of multiple NIH Institutes and Centers

Spurs subsequent biomedical advances that otherwise would not be possible without an initial strategic investment

Features of Common Fund Programs and How They Catalyze Biomedical Discovery

Making substantial investments in time-limited, goal-driven programs that significantly change the trajectory of biomedical research.

Accelerate emerging science

Remove research roadblocks

Enhance the research workforce

Support high-risk, high-reward science

Common Fund Science and Management are Collaborative

Scientists from diverse disciplines provide input as we plan new programs.

Researchers participate in interdisciplinary consortia to tackle shared goals.

Leadership and staff from Institutes, Centers, and the Office of the Director work together to design funding opportunities and oversee the projects.

Complement-ARIE Program: Purpose and Goals

Purpose: To catalyze the development, standardization, validation and use of **human-based new approach methodologies (NAMs)** that will transform the way we do basic, translational, and clinical sciences

Goals:

1. Better model and **understand human health and disease** outcomes **across diverse populations**.
2. Develop NAMs that **provide insight into specific biological processes** or disease states.
3. Validate mature NAMs to **support regulatory use** and standardization.
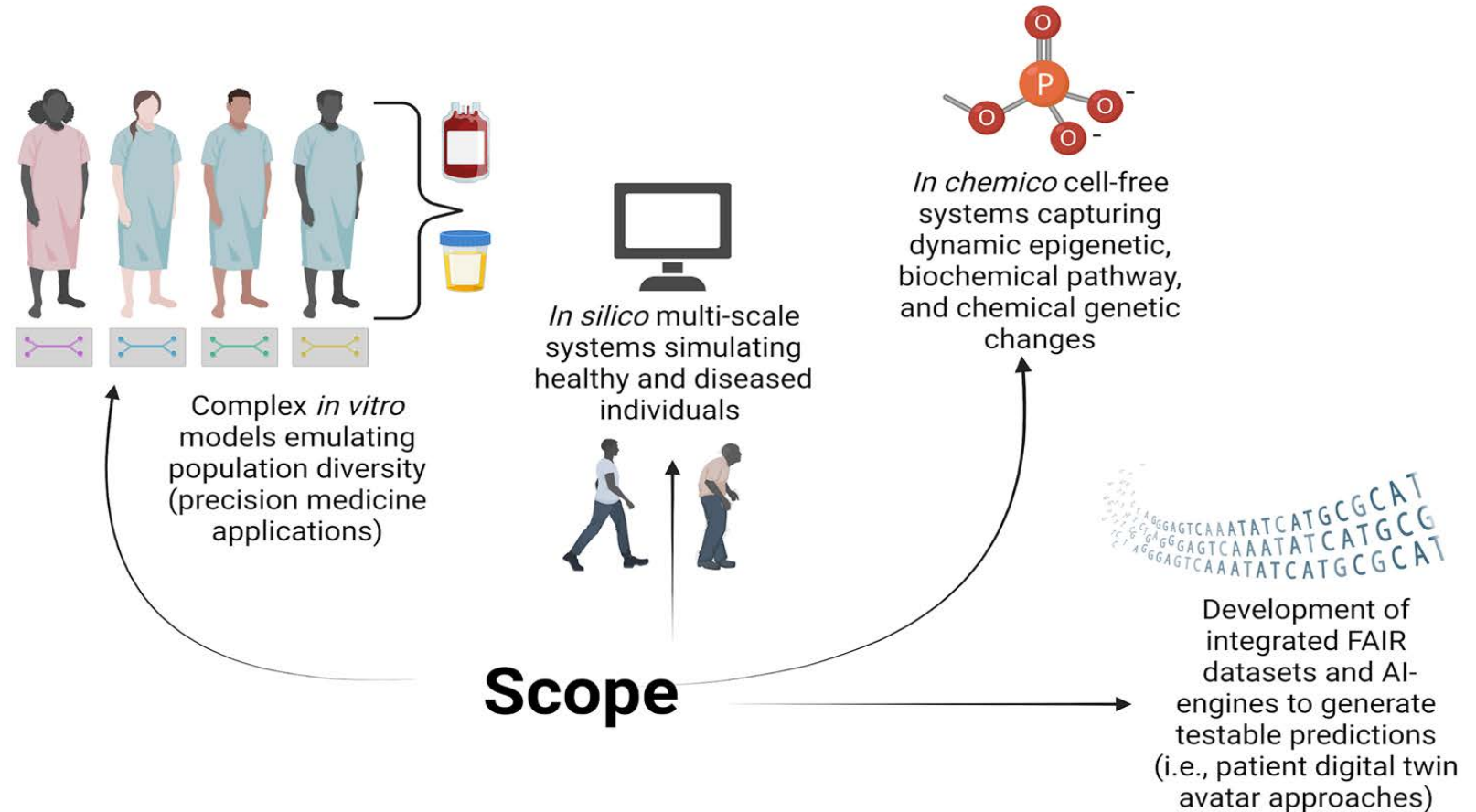4. Complement traditional mammalian animal models and **make biomedical research more efficient and effective**.

in silico

in vitro

AI

in chemico

Data Ecosystem
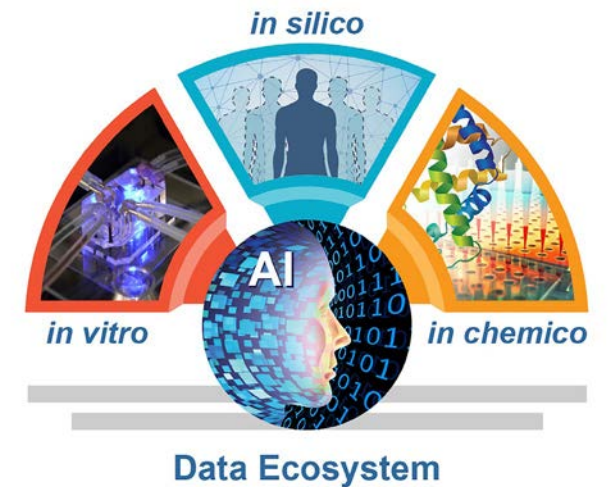
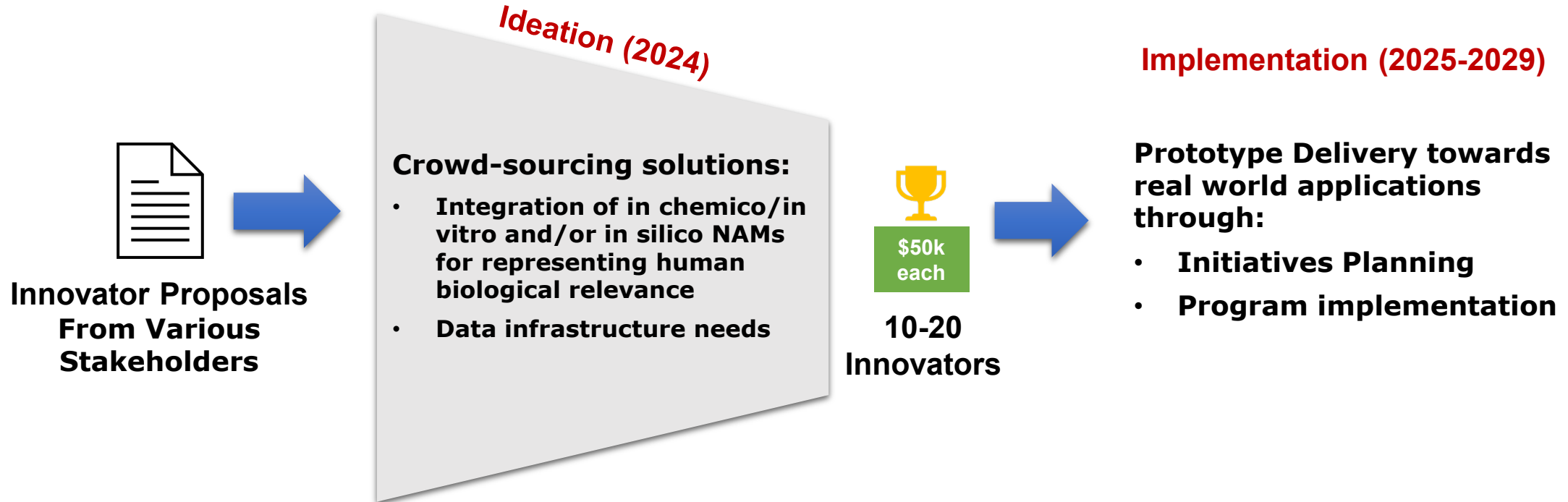# Complement-ARIE Program: Major Work Products

Program Goals:

NAMs that incorporates the following features:

- Complex *in vitro* models emulating population diversity

- *In silico* multi-scale systems simulating healthy/diseased individuals

- *In chemico* cell-free systems capturing dynamic changes

- **Combinatorial NAMs** and integrated **FAIR datasets and AI-engines** for all NAMs

Complex *in vitro* models emulating population diversity (precision medicine applications)

In silico multi-scale systems simulating healthy and diseased individuals

In chemico cell-free systems capturing dynamic epigenetic, biochemical pathway, and chemical genetic changes

Scope

Development of integrated FAIR datasets and AI-engines to generate testable predictions (i.e., patient digital twin avatar approaches)

National Institutes of Health
Office of Strategic Coordination–The Common Fund

Strategic planning activities: ideation through crowd-sourcing

· The Challenge Prize competition is part of the strategic planning process and will serve to inform topic areas for program implementation.

· $1,000,000 to make up to 20 awards ($50K each) across all categories.

· Time frame: Submission period Nov 7, 2023 – Jan 11, 2024, judging in January 2024, winners announced in February of 2024.

Ideation (2024)

Implementation (2025-2029)

Innovator Proposals From Various Stakeholders

Crowd-sourcing solutions:

· **Integration of in chemico/in vitro and/or in silico NAMs for representing human biological relevance**

· **Data infrastructure needs**

$50k each

10-20 Innovators

Prototype Delivery towards real world applications through:

· **Initiatives Planning**

· **Program implementation**

Potential Solutions Towards Complex *in vitro* models

- Ability to model the complexities of human population diversity.

- Complex NAMs to address a more complicated context of use that is not attainable by current NAM models, such as vascular, neural, and/or microbiome components.

- Incorporate complex immune function in microphysiological Systems (MPS) for emulating immune-related pathways and environmental triggers in inflammatory and autoimmune conditions.

- Standardize functional assays to assess the physiological relevance of the models.

- Sourcing patient-derived cells or tissues towards personalized models.

- Gene-editing techniques like CRISPR to introduce specific mutations into in vitro models to study disease mechanisms.

Potential Solution Towards In silico multi-scale systems and simulations

- **Simulate health and model key disease states or pathological changes (e.g., chronic inflammation, mitochondrial dysfunction, mutation accumulation, etc.)**

- **Improve predictive accuracy through incorporation of real-world clinical data**

- **Generative models to design synthetic biological systems or pathways for robust testing and validation.**

- **Ability to model the diversities of the human population.**

- **Computational models that can accurately simulate metabolic reactions in cells, providing insights into disease pathways and etiologies.**

- **Virtual clinical trial approaches that use simulations to predict how human populations might respond to therapies and enabling informed clinical trial designs.**

Potential Solutions Towards *In chemico* cell-free systems

- **Ability to capture and control dynamic epigenetic, biochemical, and genetic changes.**

- **High-throughput assays to query biologically relevant molecular properties.**

- **Incorporate advanced analytical methods to assess the full range of metabolic and proteomic changes in reaction conditions.**

- **Include cell-free expression systems as alternatives to production of biologics including those with non-natural functionalities.**

- **Implement nanotechnology to manipulate molecular interactions at an incredibly small scale.**

Complement-ARIE FY24 Ideation Challenge

Potential Solutions Towards Integrated NAMs

- Development of patient or population-level digital twins with other NAMs

- Integration of NAMs with diagnostic platforms for informed decision-making in the clinical setting (i.e., learning healthcare systems)

- Integration of AI/machine learning (ML) with other NAMs to develop predictive models

- Integrated AI and in chemico NAMs that can capture the vast complexities (e.g., socioeconomic status, diet, chemical exposure, social media interactions, etc.) in the environment around individuals and populations (i.e., exposome).

- Multi-tissue MPS coupled with AI-based governing tools and in chemico monitoring components to rapidly evaluate and adjust MPS parameters to model an individuals' unique physiology and pathophysiology.
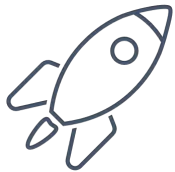
Challenge Timeline

Challenge Launched & Submission Portal Opened

Submission Deadline

11/7

12/6

1/11

Feb 2024

Informational Webinar

Winners Announced (est.)

Participant Eligibility

Team

Identify a **Team Captain** who will submit on behalf of a group of individuals.

If the Team wins, the **Team Captain** will be paid the cash prize in full.

The **Team Captain** must be a U.S. citizen or permanent resident to be eligible to receive a cash prize*.

Non-U.S. citizens and non-permanent residents are not eligible to win a monetary prize (in whole or in part). Their participation as part of a winning team, if applicable, may be recognized when the results are announced.

Entity

Identify a **Point of Contact** who will submit on behalf of a legally established organization, institution, or corporation.

If the Entity wins, the **Entity** will be paid the cash prize directly.

The **Entity** must be incorporated in and maintain a primary place of business in the United States to be eligible to receive a cash prize.

An Innovator **may not use Federal funds** from a grant award or cooperative agreement or other transaction (OT) awards to develop their Challenge submissions or to fund efforts in support of their Challenge submissions **unless use of such funds is consistent with the purpose, terms, and conditions** of the grant award or cooperative agreement.

IF

… you intend to use Federal funds, and

… the use of such funds is consistent with the purpose, terms and conditions of the award

→
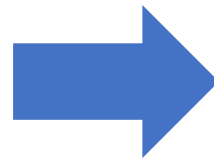
THEN

… you must register for and participate in the Challenge as an **Entity** on behalf of the awardee institution or organization, and

… the prize must be treated as program income for purposes of the original grant or cooperative agreement in accordance with applicable Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (2 CFR § 200)

Proposal Evaluation Criteria

Understanding of the Problem / Scientific Rationale

Explanation of why a novel or improved NAM is needed, potential roadblock(s) to its development, and appropriate solutions are clearly identified

Team

Interdisciplinary expertise of the team or entity submitting the idea

Feasibility

How well does the use of NAMs predict outcomes in humans? Is the verification/validation strategy sound?

Innovation

Novelty and innovation of the proposed idea.

Potential Impact

Potential impact on strategic planning, advancing use of NAMs in the specified challenge areas, and the potential for the model's application across multiple areas

Submission Process

1. All **Team** or **Entity** members must carefully review the complete Challenge Announcement posted on Challenge.gov.

2. The **Team Captain** or **Entity Point of Contact** must create an account in the Challenge submission portal. From the Challenge.gov post, click on "*Apply on external website*" and then navigate to "*How to Participate*" for instructions.

NIH

Complement-Animal Research in Experimentation (Complement-ARIE) Challenge
Shape the future of human-based biomedical research with new approach methodologies.

Apply on external website

Follow challenge (8)   Share

Submission period: Open until 01/11/24 05:01 PM EST
Challenge types: Ideas; Analytics, visualizations, algorithms; Scientific
Total cash prizes: $1,000,000
Print challenge

1. Provide all requested information and submit an entry in the portal no later than **11:59 PM Eastern Time on January 11, 2024**

Submission Requirements

✓ Project Title, Short Description, and description of your Team/Entity

✓ Executive Summary and plan language summary

✓ Description of Challenge areas addressed:

✓ Understanding of the problem

✓ Team composition and interdisciplinary expertise

✓ Approach for the proposed NAM

✓ Scientific Rationale

✓ Novelty of the Idea

✓ Potential Impact

✓ Are you submitting proposals for multiple NAMs challenges?

Panel Q&A

Follow up questions, along with project specific questions, can be emailed to: solve@herox.com

FAQs from this session will be posted **HERE**

Additional information about the Complement-ARIE concept can be found at https://commonfund.nih.gov/complementarie/strategicplanning