Biomedical Research Goes Viral: Dangers and Opportunities

Eleftheria Zeggini, Michael Baumann, Magdalena Gotz, Stephaan Herzig, Martin Hrabe de Angelis, and Matthias H. Tschop

doi.org/10.1016/j.cell.2020.05.014

Researchers around the globe have been mounting, accelerating, and redeploying efforts across disciplines and organizations to tackle the SARS-CoV-2 outbreak. However, humankind continues to be afflicted by numerous other devastating diseases in increasing numbers. Here, we outline considerations and opportunities toward striking a good balance between maintaining and redefining research priorities.
The Nutrition Research Task Force
Co-Chairs

<table>
<thead>
<tr>
<th>NIH Director</th>
<th>Francis Collins, MD, PhD</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>NRTF Co-Chairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIDDK Director – Griffin P Rodgers, MD, MACP</td>
</tr>
<tr>
<td>NHLBI Director – Gary H Gibbons, MD</td>
</tr>
<tr>
<td>NCI Director – Ned Sharpless, MD</td>
</tr>
<tr>
<td>NICHD Director – Diana W Bianchi, MD</td>
</tr>
<tr>
<td>Exec. Sec. – Christopher Lynch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Leadership Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIDDK – Christopher Lynch, PhD</td>
</tr>
<tr>
<td>NHLBI – Charlotte Pratt, PhD, MS, RD</td>
</tr>
<tr>
<td>NCI – Jill Reedy, PhD, MPH, RD</td>
</tr>
<tr>
<td>NICHD – Andrew Bremer, MD, PhD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Implementation Work Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>~50 intra and extramural scientist volunteers representing</td>
</tr>
<tr>
<td>CSR, FIC, NCI, NHGRI, NHLBI, NIA, NIAAA, NICHD, NIDA, NIDCR, NIDDK, NIEHS, NIMHD, NINR, OBSSR, ODP, ODS, OSC</td>
</tr>
</tbody>
</table>
• Taskforce formed in 2016
• Working group represented by various NIH ICs and Offices
• Lengthy and Systematic Process
• Engaged Nutrition Community
  • Request for Information
  • Crowd Sourcing
  • Thought Leader Panel
  • Consulted other federal agencies
Introducing the First Strategic Plan for NIH Nutrition Research

NEWS RELEASES

Media Advisory Wednesday, May 27, 2020

NIH releases strategic plan to accelerate nutrition research over next 10 years

What

What if each of us had individualized dietary recommendations that helped us decide what, when, why, and how to eat to optimize our health and quality of life? This precision nutrition approach — developing targeted and effective diet interventions in a personalized manner — is among the ambitious goals set out by the 2020-2030 Strategic Plan for National Institutes of Health Nutrition Research.
Individual Variability in Dietary Responses

(Each bar represents one individual)

HIGH CARB vs LOW CARB

Potential of Precision Nutrition

1. Maximize opportunities to observe inter-individual variability in a wide range of responses to diet interventions by studying diverse participants

2. Research on Sources of Individual Variability in Diet-Health Relationships
   - Genetics
   - Microbiome
   - Health Status
   - Physio-metabolic nutrition responses

3. Combine comprehensive linked datasets of diet, genetics, physio-metabolic, microbiome measures
   - Nutrition microbiome genetic interplay

4. Artificial Intelligence is able to interpret all of the different types of data to help predict health outcomes
   - Data translation
   - Artificial intelligence (A.I.)

5. Custom plans to help individuals make better dietary choices
   - Individual health recommendations

**Current State:** Population-based diet recommendations
What’s Inside
The 2020-30 Strategic Plan for NIH Nutrition Research?

Unifying Vision: *Precision Nutrition*
Precision Nutrition is the overarching theme with multiple Strategic Goals and Cross-cutting Research Areas.

1. Spur Discovery Innovation through Foundational Research
   - Minority Health and Health Disparities

2. Investigate the Role of Dietary Patterns and Behaviors for Optimal Health
   - Health of Women

3. Define the Role of Nutrition Across the Life Span for Healthy Development and Aging
   - Data Science, Systems Science, and Artificial Intelligence (A.I.)

4. Reduce the Burden of Disease in Clinical Settings
   - Cross-Cutting Research Areas
   - Training the Scientific Workforce

Rigor and Reproducibility
Strategic Goals will Achieve Precision Nutrition Vision

1. Spur Discovery and Innovation through Foundational Research—*What do we eat and how does it affect us?*

2. Investigate the Role of Dietary Patterns and Behaviors for Optimal Health—*What and when should we eat?*

3. Define the Role of Nutrition Across the Lifespan—*How does what we eat promote health across our lifespan?*

4. Reduce the Burden of Disease in Clinical Settings—*How can we improve the use of food as medicine?*
Implementation Workgroups

• Implementation Work Groups (IWGs) were formed last year and have been meeting around topic areas in the Strategic Plan.

• **Goal is to implement the Strategic Plan by developing truly trans NIH activities and initiatives that are inspired by the Strategic Goals and Objectives in the Plan.**

• The IWGs have:
  • Performed portfolio analyses with assistance from Office of Nutrition Research
  • Developed short- and long-term goals
  • Outlined workshop concepts, guidance for other IWGs, trans NIH initiatives, and/or Grand Challenges
New tools to move Precision Nutrition forward

GI & Microbiome Explorer (Smart Pill) Project
NOT-DK-19-021 & PAR-20-133

Continuous Analyte Monitors Project
NOT-DK-19-021 & PAR-20-134
• In Sept, NIH cleared a Common Fund concept at the Sept. Council of Councils meeting: Nutrition for Precision Health, powered by the All of Us Research Program

• First NIH Common Fund program dedicated to nutrition

• First ancillary study nested in the All of Us Cohort

• The videocast presentation of the project can be viewed here (discussion begins at 1:54:00). Slides and a brief write-up are also available
Leverage existing NIH investments - including the All of Us Study - and emerging technologies and tools to make the critical discoveries to steer nutrition research toward personalized approaches.

**STUDY GROUP NESTED IN ALL OF US**

1. **MODULE 1**
   - Examine usual diet with continuous glucose monitoring, followed by a mixed meal challenge, and microbiome/metabolic phenotyping
   - n=10,000

2. **MODULE 2**
   - Randomized dietary interventions done at home as a subset of Module 1
   - n=1,500

3. **MODULE 3**
   - Randomized dietary interventions conducted in inpatient controlled feeding centers where precise nutritional intakes, microbiome ecology, and physio-metabolic data can be rigorously obtained
   - n=500

**LEVEL OF MICROBIOME, PHYSIO-METABOLIC AND DIET RESPONSE DATA AVAILABLE FROM PROPOSED MODULES**

Deliverable: ALGORITHMS THAT PREDICT INDIVIDUAL RESPONSES TO DIETS
Why All of Us?

• Large, well-phenotyped cohort
• Commitment to diversity and inclusion
• Existing infrastructure, including Data and Research Center, Biobank, and Participant Technology Systems Center
• Availability of data, including genomics, electronic health records, mHealth data, and participant-provided information
• Data access and sharing policy, Researcher Workbench
• Artificial Intelligence for Multimodal Data Modeling and Bioinformatics Center (U54 Clinical Trial Not Allowed) (NOT-RM-21-001)
• Metabolomics and Clinical Assays Center (U24 Clinical Trial Not Allowed) (NOT-RM-21-002)
• Microbiome and Metagenomics Center (U24 Clinical Trial Not Allowed) (NOT-RM-21-003)
• Dietary Assessment Center (U24 Clinical Trial Optional) (NOT-RM-21-006)
• Clinical Centers (UG1 Clinical Trial Required) (NOT-RM-21-007)
• Research Coordinating Center (U24 Clinical Trial Not Allowed) (NOT-RM-21-008)
• **Register for the workshop URL**
• **Meeting Co-chairs:** José Ordovás, Ph.D., Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University; Elizabeth Parks, Ph.D., University of Missouri, and Bruce Y. Lee, M.D., MBA, City University of New York School of Public Health
• Poster sessions and awards available
• Request for Information: Data Science Challenges and Opportunities in the Field of Precision Nutrition

• **Notice Number:** NOT-RM-21-005

• **Response Date:** November 15, 2020

• Responses submitted electronically to nutritionresearch@nih.gov
Opportunities for the nutrition research community to engage ad hoc with NIH staff in person has been and will continue to will be limited in the next year.

Through our new NutRitioNaLS program, we’re facilitating discussions between relevant NIH staff and nutrition research stakeholders (trainees, scientists or groups). Listening sessions topics may provide input on emerging opportunities, challenges/barriers and potential solutions that could:

- Accelerate progress in foundational, preclinical and clinical nutrition research
- Identify ways that NIH could better support nutrition research training, career development, and progression
- Facilitate the development and application of tools, methods, or technologies that would advance nutrition research
- Advance development and implementation of behavioral nutrition interventions

We’re listening.
For More Information


Contact us at: NutritionResearch@NIDDK.NIH.GOV

#NIHNutritionResearch
Thank you