NIH Common Fund
Metabolomics Program

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The NIH Common Fund: A Different Approach to Science Management

- Exceptionally high impact
- Broadly applicable
- Benefit from strategic planning and coordination

Managed by the Office of Strategic Coordination in the Office of the Director, NIH

http://commonfund.nih.gov/
Current Common Fund Programs (FY16)

New Types of Clinical Partnerships
- Illuminating the Druggable Genome
- Health Economics
- Undiagnosed Diseases Network
- HCS Research Collaboratory
- High-Risk Research

Transformative Tools/Methods
- Regenerative Medicine Program
- Regulatory Science
- Single Cell Analysis
- Protein Capture
- Big Data to Knowledge (BD2K)
- Knockout Mouse Phenotyping
- Stimulating Peripheral Activity to Relieve Conditions (SPARC)
- Science of Behavior Change

Pioneer Awards
New Innovator Awards
Transformative Research Awards
Early Independence Awards

Metabolomics
- 4D Nucleome
- Extracellular RNA Communication
- Genotype-Tissue Expression
- Epigenomics
- Library of Integrated Network-Based Cellular Signatures (LINCS)

Molecular Transducers of Physical Activity

Global Health

New Paradigms

Transformative Workforce Support
www.commonfund.nih.gov
Why Metabolomics?

**Metabolomics**: The systematic study of the metabolites in cells, tissues, and a variety of biospecimens, typically utilizing MS or NMR analytical platforms.

- High potential to contribute greatly to our knowledge of health and disease.
- Applicable to basic, clinical, and translational research.
- Trans-NIH relevance.
- Likely to benefit from strategic coordination.
Assessing Outstanding Needs

- Development of **new technologies** and adoption of existing technologies and methods.

- Availability of **metabolite reference standards** and mechanisms to make new ones as needed.

- **Specialized facilities** that provide high quality metabolomics data, analyses, and interpretation available for collaboration or fee-for-service.

- **Training** for biomedical scientists in the technology, biochemistry, and bioinformatics needed for metabolomics studies.

- A centralized location to store **high-quality metabolomics data** and provide tools for **data analysis**.
The Common Fund Metabolomics Program was initiated in 2012 to increase the national capacity in metabolomics by developing:

- Training in Metabolomics
- Metabolomics Reference Standards
- Comprehensive Metabolomics Resource Cores
- Metabolomics Technology Development
- Metabolomics Data Sharing and International Collaboration

https://commonfund.nih.gov/metabolomics/
To Meet These Goals:

• Regional Comprehensive Metabolomics Resource Cores (RCMRCs)
• Data Repository and Coordinating Center (DRCC)
• Technology Development (R01) Awards
• Mentored Research Training (K01) Awards
• Grants to Develop Metabolomics Courses
• Metabolite Standards Synthesis Contracts
• Administrative Supplements to Existing NIH Grants
• Pilot and Feasibility (P&F) Awards
• Data Analysis Grants (R03)
The Regional Comprehensive Metabolomics Resource Cores (RCMRCs)

University of Michigan (Charles Burant)
University of California, Davis (Oliver Fiehn)
Research Triangle Institute (Susan Sumner)
University of Florida (Rick Yost)
Mayo Clinic (K. Sreekumaran Nair)
University of Kentucky (Rick Higashi)

Visit their individual webpages or access through: http://www.metabolomicsworkbench.org/
Goals of the RCMRCs:

• Provide metabolomics services for the research community
  – Fee-for-Service (at cost)
  – Collaborative Pilot and Feasibility (P&F) Program
• Technology development
  – Data generation and analysis
• Metabolomics workforce development
• Consortium member - enhancing the field of metabolomics
• Data Sharing
• Build customer base to become self-sustaining
RCMRC Accomplishments:

- **159** P&F awards since 2013
- **73%** outside home institution

**Workshops**

**Symposia**

- **1781** service requests accepted in past 2 years
- **39** unique institutions/year per RCMRC

**Individual training**

- **289** publications in past 2 years
- **307** datasets deposited

➢ **RCMRCs on target to be financially self-sufficient**
Data Repository and Coordinating Center (DRCC)

Data Repository and Coordinating Center (DRCC) at UC San Diego (Shankar Subramaniam)

Visit their individual webpages or access through: http://www.metabolomicsworkbench.org/
Goals of the DRCC:

• Develop **data repository** to accept high quality metabolomics datasets from a wide variety of studies
• Collaborate with **international colleagues** to develop minimum requirements for submission of data
• Coordinate **consortium activities** to maximize exchange of best practices and technical advances
• Develop overall **Promotion and Outreach** plan for the Program
DRCC Accomplishments:

- Developed **data repository** for raw spectra and processed metabolomics data
- Created a **web portal** for consortium activities and resources including datasets, analytical tools, training, protocols etc.

- 492 registered users
- 371 datasets deposited

### Summary of all studies

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Study Title</th>
<th>Species</th>
<th>Institute</th>
<th>Analysis</th>
<th>Release Date</th>
<th>Version</th>
<th>Samples</th>
<th>Download</th>
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<td>ST000001</td>
<td>Fatb Induction Experiment (FatBE)</td>
<td>Arabidopsis thaliana</td>
<td>University of California, Davis</td>
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[metabolomicsworkbench.org](http://metabolomicsworkbench.org)
DRCC Collaborative Accomplishments:

• Developed minimal metadata standards
• Created a reference directory of metabolite names
• Coordinated an inter-lab reproducibility exercise
• Worked with international metabolomics community to promote data sharing
High-quality metabolite standards are synthesized under contracts to SRI International and RTI International. Provides metabolomics researchers with high-quality metabolite standards that have high potential in translational research at no cost. 20 standards completed; 35 in process.

Nominate a compound or request an aliquot today!

View the list of nominated compounds or nominate new compounds at: http://www.metabolomicsworkbench.org/standards/index.html
Metabolomics Technology Development

Program has improved the extraction, separation, detection and identification of metabolites

<table>
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<tr>
<th>Project</th>
<th>PI</th>
<th>Technology</th>
<th>Publications</th>
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<td>R01ES022181</td>
<td>Patti</td>
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Enhancing the Metabolomics Workforce

K01 mentored training
P&F projects
Admin Supplements
Internships/sabbaticals

Small group workshops:
R25 UAB course
RCMRCs

RCMRC symposia
On-line course

Individual instruction

Reaching the masses

Supported by NIH/NIDDK award R25GM103798 and R25GM103802
The NIH Investment in Metabolomics Continues to Increase
Striving to Meet the Evolving Needs of the Metabolomics Community

• Continuing to enhance the Metabolomics Workbench in response to community feedback
• Improving the tools available for metabolomics studies, including data analysis and interpretation
• Offering training at all levels
• Working to identify and promote best practices in study design, data acquisition, and data analysis
Common Fund Metabolomics Working Group

Chairs:
NCI  Dinah S. Singer
NIDDK  Philip Smith

Coordinators:
NCI  Barbara Spalholz
NIDDK  Arthur L. Castle
OD  Leslie Derr

Project Team Leaders:
NCI  Keren Witkin (ME Program Director)
NHLBI  Pothur R. Srinivas (Reference Standards)
NIDDK  Padma Maruvada (RCMRCs, DRCC)
NIEHS  David M. Balshaw (Technologies)
NIGMS  Richard T. Okita (Training)
NCATS  Danilo Tagle
NCI  Mukesh Verma
NCI  Krista Zanetti
NHGRI  Lita M. Proctor
NHLBI  Simhan Danthi
NIA  Yih-Woei Fridell
NIAAA  Gary J. Murray
NIAID  Conrad Malia
NIAMS  Hung Tseng
NIDA  Amy Lossie
NIDCR  Lillian Shum
NIDDK  Leeanna Arrowchis
NIEHS  Andy Maynard
NIEHS  Dan Shaughnessy
NIMH  Laurie S. Nadler
NINDS  Katrina Gwinn
OD  Aron Marquitz
OD  Nicole Lim