

# Understanding the Mechanisms of Physical Activity-Induced Health Benefits

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Council of Councils

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# 2013 Initiative Concept

**Physical activity (PA)** benefits the human body in a multifactorial manner including reduction of disease risk and improved healthspan.

**PA is a trans-NIH area of research**, with a current substantial investment in basic and clinical research/trials using PA, mostly focused on health outcomes or improving compliance with PA recommendations.

**Mechanisms for health benefit of PA** would allow for tailored PA prescriptions, new strategies to increase PA, improve health response to PA, and uncover novel molecular targets for therapeutics.

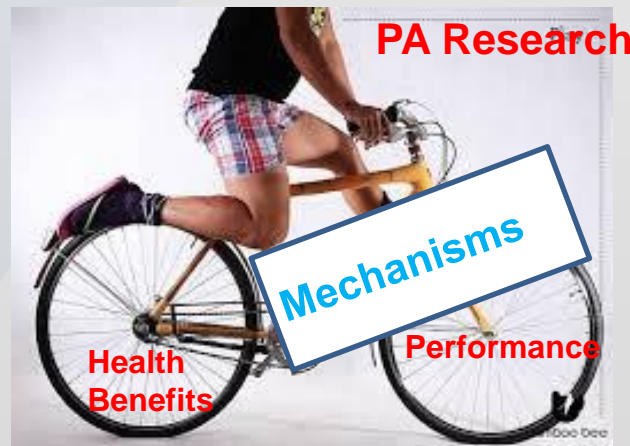
# Definitions

## Physical activity:

Any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure **above a basal level** (from the CDC)

## Mechanisms:

**Molecules and cellular pathways** that mediate the physiologic, metabolic, behavioral, and cognitive changes in response to acute or chronic PA



# Physical Activity Working Group

## 3 IC Director Champions

Katz, Stephen (NIAMS)

Hodes, Richard (NIA)

Rodgers, Griffin (NIDDK)

## 4 Coordinating Committee members from the 3 lead ICs

McGowan, Joan (NIAMS)

Williams, John (NIA)

Laughlin, Maren (NIDDK)

Boyce, Amanda (NIAMS)

## 24 members from 11 additional ICs or NIH Offices

Alfano, Catherine (NCI)

Drugan, Jonelle (NIAMS)

Khalsa, Partap (NCCAM)

Blaisdell, Carol (NHLBI)

Evans, Mary (NIDDK)

Maruvada, Padma (NIDDK)

Boyington, Josephine (NHLBI)

Fleg, Jerome (NHLBI)

Mueller, Christine (DPCPSI)

Breslow, Rosalind (NIAAA)

Garcia-Cazarin, Mary (ODS)

Perna, Frank (NCI)

Christian, Carole (OPA)

Hardy, Lynda (NINR)

Portnoy, Barry (ODP)

Compton, Wilson (NIDA)

Haverkos, Lynne (NICHD)

Tigno, Xenia (NHLBI)

Cooper, Lawton (NHLBI)

Joseph, Lyndon (NIA)

Troiano, Richard (NCI)

Diana, Augusto (NIDA)

Kautz, Mary (NIDA)

Winsky, Lois (NIMH)

# Questions that needed to be resolved through the planning process

- What is the current NIH investment?
- Are there scientific gaps? What are the most pressing needs and opportunities?
- What are the obstacles/barriers to research?
- What can we accomplish in 5-10 years of a Common Fund initiative?
- What will be the eventual contribution to U.S. health?

# Strategies for answering questions

- **Portfolio analysis**

- Of >30,000 **active** 2013 NIH grants, ~1100 employed PA.
- Of the >30,000, 163 (0.5%) were classified as PA + mechanistic.
- They were funded by 13 NIH ICs.

- **Request for Information (NOT-RM-14-001)**

- Active from December 13, 2013, through January 14, 2014.
- Received ~80 unique responses.

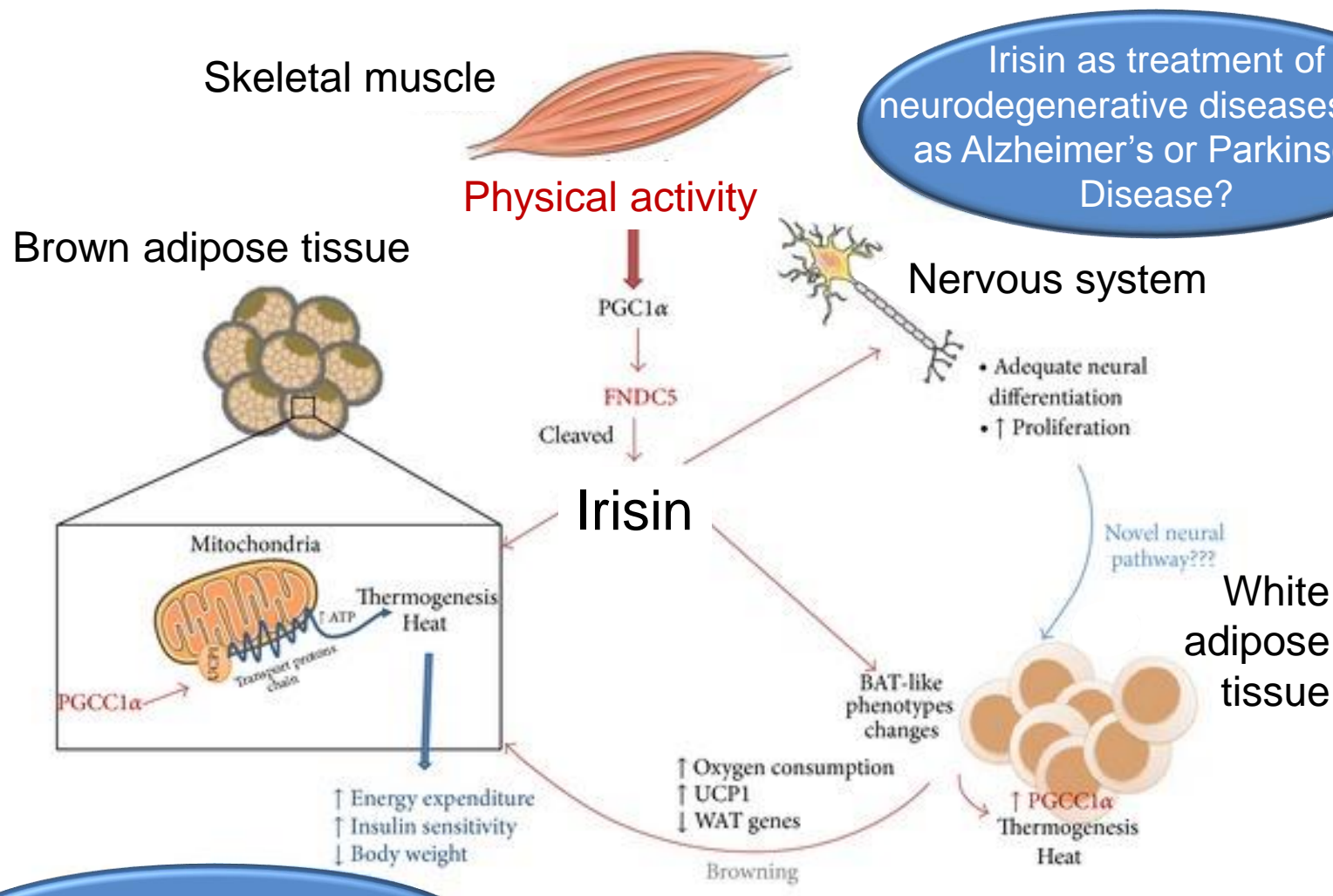
- **Discussions with the research community**

- Lunch with speakers at the Gerosciences Summit (October 2013).
- Two teleconferences (January 17 and 20, 2014).

# It is the perfect time for mechanistic physical activity research

- Intense public and scientific interest in PA
- Exciting interdisciplinary research climate
  - novel myokines involved in metabolic health
  - neurogenesis in response to PA
- Access to new -omics tools for discovery

# Current Mechanistic Model of PA-induced Actions



Irisin as treatment of neurodegenerative diseases such as Alzheimer's or Parkinson's Disease?

Irisin as treatment of diabetes and obesity?



# It is the perfect time for mechanistic physical activity research

- Remarkable health effects of PA
- Relatively little current investment
- Little interaction between exercise physiologists and biomedical researchers
- Insufficient access to tools and standardized models

# Goals and Deliverables

## Long-term Goal

- Transform and inform clinical medicine's **effective** use of PA as an intervention.

## Deliverables

- **Discover pathways and molecules** involved in transmitting the benefits of PA to tissues and organs.
- **Identify molecular targets** for drug development.
- **Standardize PA protocols** and **identify useful animal models**.
- **Train** the future interdisciplinary workforce.

# Proposed Strategy

When	Initiative	Details	Budget
Fall 2014	Interdisciplinary Planning Workshop for Community Input	<ul style="list-style-type: none"><li>• Interdisciplinary team building</li></ul>	\$200K
2015	Supplements	<ul style="list-style-type: none"><li>• PA arm to mechanistic study</li><li>• Mechanistic arm to PA study</li></ul>	\$2M/yr 2 years
2015-2016	Interdisciplinary Networks	<ul style="list-style-type: none"><li>• Training</li><li>• Pilot and feasibility projects</li><li>• Standardized protocols</li><li>• Discovery projects (“omics,” microbiome)</li></ul>	\$20M/yr 5 years

# Long Term Outcomes

**Scientific Goal:** Elucidate the beneficial mechanisms of PA for overall health throughout the lifespan, and alter the research landscape so that PA is routinely used as a tool.

**Environmental Goal:** Establish a research climate in which PA is typically used, and train young investigators how to rigorously apply PA to answer mechanistic questions.

**Clinical Goal:** Provide the basic knowledge for personalized PA doses, new approaches to rehabilitation following injury and disease, and novel therapeutics as adjuncts for PA.

**Sustainability Goal:** Partner with professional organizations to maintain knowledge base and community enthusiasm.



# Comments?

