

The background features a grey field with abstract white and orange lines. A white grid-like structure is partially visible, with diagonal lines crossing it. Large, thick orange lines form a stylized, overlapping shape that resembles a large 'E' or a similar character. A dark green line also overlaps the orange shape at the bottom left.

MITOCHONDRIAL
BIOLOGY IN
CARDIOVASCULAR
HEALTH & DISEASES
CONFERENCE

Executive Summary
October 6-7, 2008

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Introduction

Mitochondrial research is gaining momentum in many areas of medicine. There has been a resurgence of investigation into the biology of mitochondria. In particular, recent advances in proteomics and imaging technologies have markedly enhanced our understanding pertaining to the molecular and biochemical functioning of mitochondria. This knowledge has, in turn, led to the realization that the regulation of mitochondrial function, turnover, and content affects various physiological systems. Many groups, here and abroad, have been working on disparate aspects of mitochondrial research. As the number of studies grows and results raise new possibilities and questions, the ever-present need for exchange of information and expertise among researchers in the field becomes more pressing. This conference at the National Institutes of Health brought together leading thinkers in the field of mitochondrial biology to review the most current knowledge of the mitochondrial regulatory program and its role in cardiovascular health and disease.

Sponsors

National Heart, Lung, and Blood Institute, NIH
Office of Rare Diseases, Office of the Director, NIH
Society for Heart and Vascular Metabolism

Chair- Organizing Committee

Michael Sack, MD, PhD

Conference Design and Content

This conference consisted of eight plenary sessions over the course of two days; it featured thirty-three distinguished speakers, eight session chairs, four oral podium presenters, and the presentation of posters. These latter promote the one-on-one discussions between presenters and participants that distinguish this meeting and reinforce its objectives.

This conference brought together participants from the many walks of mitochondrial research to discuss the state of the art. Featured speakers included experts in mitochondrial function in cardiovascular disease, mitochondrial homeostasis, mitochondrial dysfunction and genetic diseases, and the mitochondrial role in increasing cardiovascular risk. Investigators presented posters and twenty five received Poster Awards and or travel funds. During lunches and after plenary sessions, participants viewed nearly 150 poster topics with their colleagues.

Participant Demographics

Participants: Registration for the 2008 conference meeting exceeded expectations with a total of 522 pre-registered attendees, additionally 92 participants registered on site. Fourteen percent of attendees were international participants. Out of all participants, 311 participants reported their profession as Researcher (approximately 51%) while 53 reported themselves as physicians (about 9%). About 36 participants were listed as with an “other” profession (6%)

Poster: One hundred forty-eight posters were submitted. Twenty percent of the abstracts submitted received awards: Oral Podium Presentation (4), Scientific Poster Award (15) or Travel Award (11). Lunches featured poster sessions for the poster researchers.

CME: Thirty-three physicians that attended the conference claimed a maximum of 13 credit hours for their continuing medical education.

Response to the 2008 Conference

We received a highly gratifying response to the meeting: forty six participants responded to the exit survey. Numerous participants gave enthusiastic answers regarding the quality of presentations and course content. Also, 99% of the respondents rated the meeting as considerably promoting scientific exchange of ideas.

Question 1: Were the Activity Objectives (Explaining current advances, exploring the application of novel therapeutics, proposing collaborative relationships) met?

The participants felt the activity objectives were sufficiently met. Advances in mitochondrial biology and their function at molecular and biochemical levels were satisfactorily discussed and the application of novel therapeutics targeting mitochondrial function to modulate cardiac risk factors and treat cardiovascular disease adequately explored; all those surveyed strongly agreed or agreed with these statements. However, more collaborative relationships could have been established, as some of those surveyed were more neutral in their response than in agreement.

Question 2: Will you change your practice in any way as a result of attending this course?

Most of those surveyed (42%) responded that they wouldn't change their practice, while 25% did not respond to the question. This is most likely due to the fact that most of the attendees were researchers, rather than physicians.

Question 3: Please evaluate this activity as a whole:

All of the attendees that responded in the overall evaluation gave the activity ratings of "Good" or higher, and more than half of them rated it as "Excellent." More than 90% of respondents rated the course organization, course content, quality of presentations and audiovisual aids as "good" or better. Ratings of the course usefulness, conference facilities, and registration process were also generally very good. The range of ratings for syllabus materials was large, as equal numbers of respondents gave "Excellent" or "Fair" ratings.

Question 4: Do you feel the activity was objective, balanced, and free of commercial bias?

The majority (92%) of the respondents felt that the activity was free from bias.

Question 5: This activity should improve my (practice, procedural or cognitive Skills...)

As most attendees were researchers, many of those surveyed did not comment on how the conference improved their medical knowledge, care attitudes, practice behavior or their patients' clinical outcomes. The majority of those that did respond felt somewhat agreed with the statement or felt neutral. However, a strong majority agreed that the conference would improve their cognitive skills and research awareness.

Response to the 2008 Conference (con'td)

Question 6: Please evaluate the daily lectures:

Drs Mootha, Shulman, and Spiegelman received the highest percentages and frequencies of excellent ratings. Drs Clarke and Lippincott-Schwartz also had high frequencies of excellent ratings.

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Agenda

October 6, 2008		
Start Time	Finish Time	Welcome
8:00 AM	- 8:05 AM	Michael N. Sack, MD, PhD
8:05 AM	- 8:15 AM	Elizabeth G. Nabel, MD
Session 1		The Regulatory Control of Mitochondrial Homeostasis Chair: Daniel P. Kelly, MD
8:15 AM	- 8:35 AM	Proteolytic Control of Mitochondrial Biogenesis and Dynamics Thomas Langer, PhD
8:35 AM	- 8:55 AM	The PGC Family is Master Regulators of Mitochondrial Biogenesis Bruce M. Spiegelman, PhD
8:55 AM	- 9:15 AM	Assembling the Components and Circuitry for Mitochondrial Biogenesis Vamsi K. Mootha, MD
9:15 AM	- 9:35 AM	Mitochondrial Gene Expression and Signaling in Disease and Aging Gerald S. Shadel, PhD
9:35 AM	- 9:50 AM	Oral Poster - Biological Function of SIRT5 in Metabolism Takashi Nakagawa, MD, PhD
9:50 AM	- 10:25 AM	Break
Session 2		Reactive Oxygen Species Biology, Calcium and the Role of Mitochondria in Signal Transduction Chair: Toren Finkel, MD, PhD
10:25 AM	- 10:45 AM	Mechanisms of Cardioprotection by Nitric Oxide acting at the Mitochondrial Level Paul S. Brookes, PhD
10:45 AM	- 11:05 AM	New Perspectives on the Role of Mitochondria in Heart Disease Brian O'Rourke, PhD
11:05 AM	- 11:25 AM	Keeping Mitochondria in Shape: A Matter of Life and Death Luca Scorrano, MD, PhD
11:25 AM	- 11:45 AM	Mitochondrial Production of Reactive Oxygen Species Dmitry B. Zorov, PhD
11:45 AM	- 12:05 PM	Mitochondrial Pathways for Reactive Oxygen Species Formation and Myocardial Injury Fabio Di Lisa, MD
12:05 PM	- 1:35 PM	Lunch/Attended Poster Session
Session 3		Proteomics in Advancing the Understanding of Mitochondrial Biology Chair: Peipei Ping, PhD
1:35 PM	- 1:55 PM	The Dynamics of the Mitochondrial Proteome Peipei Ping, PhD
1:55 PM	- 2:15 PM	Analysis of the Effects of Bi-ventricular Pacing on the Mitochondrial Sub-proteome Jennifer Van Eyk, PhD
2:15 PM	- 2:35 PM	Systems Biology of the Mitochondria Robert S. Balaban, PhD
2:35 PM	- 2:50 PM	Oral Poster- Proteomics of Lysine Acetylation in Mitochondrion Yingming Zhao, PhD
Session 4		Imaging of Mitochondrial Function Chair: Robert S. Balaban, PhD
2:50 PM	- 3:10 PM	Dynamic Cardiac Mitochondria W. Jonathan Lederer, MD, PhD
3:10 PM	- 3:35 PM	Break
3:35 PM	- 3:55 PM	A Functional Link between Mitochondrial Morphology and Cell Cycle Progression at G1-S Jennifer A. Lippincott-Schwartz, PhD
3:55 PM	- 4:15 PM	Mitochondrial Energy Metabolism in the Diabetic Heart and Skeletal Muscle Kieran Clarke, PhD
4:15 PM	- 4:35 PM	Mitochondria from Cradle to Grave Roberta Gottlieb, MD
4:35 PM	- 4:50 PM	Oral Poster- PDGFR β Signaling is an Essential Component of the Cardiac Response to Load Induced Stress Aarif Y. Khakoo, MD
4:50 PM	- 5:00 PM	Scientific Poster Award Presentation

Agenda (cont'd)

October 7, 2008		
Start Time	Finish Time	
8:00 AM	- 8:15 AM	Welcome Robert S. Balaban, PhD
Session 5		Mitochondrial Dysfunction and Genetic Diseases Chair: Paul Hwang, MD, PhD
8:15 AM	- 8:35 AM	Metabolic Basis of Hypertrophic Cardiomyopathy Hugh Watkins, MD, PhD
8:35 AM	- 8:55 AM	Mitochondrial Dynamics in Development and Disease David C. Chan, MD, PhD
8:55 AM	- 9:15 AM	Mitochondria-Targeted Antioxidants as Potential Therapies Michael P. Murphy, PhD
9:15 AM	- 9:30 AM	Oral Poster - Reduced Fatty Acid Metabolism and Elevated Mitochondrial H2O2 Emission Are Associated with Decreased PPARα in Diabetic Human Myocardium Ethan Anderson, PhD
9:30 AM	- 9:55 AM	Break
Session 6		Mitochondrial Role in Increasing Cardiovascular Risk including Obesity and Type II Diabetes Chair: Michael N. Sack, MD, PhD
9:55 AM	- 10:15 AM	The Role of Insulin Signaling in Mitochondrial Dysfunction Evan Dale Abel, MD, PhD
10:15 AM	- 10:35 AM	Mitochondrial Dysfunction and Type 2 Diabetes Gerald I. Shulman, MD, PhD
10:35 AM	- 10:55 AM	Role of Skeletal Muscle in Human Energy Metabolism Kong Y. Chen, PhD
Session 7		Mitochondrial Function in Cardiovascular Disease- Ischemia, Hypertrophy and Heart Failure Chair: Elizabeth C. Murphy, PhD
10:55 AM	- 11:15 AM	Connexin 43 in Mitochondria: Functional Importance Rainer Schulz, MD, PhD
11:15 AM	- 11:35 AM	Molecular Identity of the Mitochondrial Permeability Transition Pore Christopher P. Baines, PhD
11:35 AM	- 11:55 AM	Cardioprotection and Altered Mitochondrial Transport Charles J. Steenbergen, Jr., MD, PhD
11:55 AM	- 1:25 PM	Lunch/Attended Poster Session
1:25 PM	- 1:45 PM	Mitochondrial Function and Energy Metabolism in Heart Failure Rong Tian, MD, PhD
1:45 PM	- 2:05 PM	Dysregulation of the PGC-1 Cascade in the Failing Heart Daniel P. Kelly, MD
2:05 PM	- 2:25 PM	The Modulation of Mitochondrial Respiration by Nitrite During Ischemia/Reperfusion Sruti Shiva, PhD
Session 8		The Mitochondria as a Therapeutic Target in Cardiovascular Disease Chair: Heinrich Taegtmeyer, MD, PhD
2:25 PM	- 2:45 PM	Inhibition of GSK-3β in Cardioprotection Steven J. Sollott, MD
2:45 PM	- 3:05 PM	Genes and Small Molecules That Slow Aging-Effects on Cardiovascular Disease David A. Sinclair, PhD
3:05 PM	- 3:30 PM	Break
3:30 PM	- 3:50 PM	Targeting Malonyl CoA Inhibition of Mitochondrial Fatty and Uptake as an Approach to Treat Cardiac Ischemia Gary D. Lopaschuk, PhD
3:50 PM	- 4:10 PM	Pre and Postconditioning: from Laboratory Bench to Hospital Bedside Derek M. Yellon PhD, DSc
4:10 PM	- 4:30 PM	Novel Therapies for Mitochondrial Pathology in Heart Failure William C. Stanley, PhD
4:30 PM	- 4:45 PM	Closing Remarks Michael N. Sack, MD, PhD

Web Sites

Conference web site: www.mitochondrial2008.com

Organizing Committee Website: www.strategicresults.com/mito_OC/

Speaker Website: www.strategicresults.com/mito_speakers/

Appendixes

Exit Questionnaire
Program Guide (CD)

Exit Questionnaire

Questionnaires were included in the program guide. The participants were asked to complete and leave at the welcome desk. The completed questionnaires were submitted at the end of the second day, along with CME details.

Exit Questionnaire

Question 1

Were the following Activity Objectives Met?

1a. To discuss and explain current advances in the understanding of mitochondrial biology and function at the molecular and biochemical levels

Strongly Agree	53%	(19)
Agree	44%	(16)
Neutral	0%	(0)
Disagree	0%	(0)
Strongly Disagree	0%	(0)
N/A	4%	(1)

1b. To explore the application of novel therapeutics targeting mitochondrial function to modulate cardiac risk factors and treat cardiovascular disease

Strongly Agree	42%	(15)
Agree	47%	(17)
Neutral	6%	(2)
Disagree	0%	(0)
Strongly Disagree	0%	(0)
N/A	6%	(2)

1c. To propose collaborative relationships with other health professionals who share an interest in pursuing novel applications in this emerging field

Strongly Agree	44%	(16)
Agree	42%	(15)
Neutral	11%	(4)
Disagree	0%	(0)
Strongly Disagree	0%	(0)
N/A	4%	(1)

Question 2

Will you change your Practice in any way as a result of attending this course?

Yes	33%	(12)
No	42%	(15)
N/A	25%	(9)

Question 3

Please Evaluate this activity as a whole:

3a. Overall Evaluation

Excellent	56%	(20)
Very Good	28%	(10)
Good	14%	(5)
Fair	0%	(0)
Poor	0%	(0)
N/A	3%	(1)

Exit Questionnaire (cont'd)

3b. Course Organization

Excellent	53%	(19)
Very Good	28%	(10)
Good	14%	(5)
Fair	3%	(1)
Poor	0%	(0)
N/A	3%	(1)

3c. Course Content

Excellent	42%	(15)
Very Good	42%	(15)
Good	14%	(5)
Fair	0%	(0)
Poor	0%	(0)
N/A	3%	(1)

3d. Usefulness

Excellent	44%	(16)
Very Good	31%	(11)
Good	14%	(5)
Fair	8%	(3)
Poor	0%	(0)
N/A	3%	(1)

3e. Quality of Presentations

Excellent	50%	(18)
Very Good	33%	(12)
Good	11%	(4)
Fair	3%	(1)
Poor	0%	(0)
N/A	3%	(1)

3f. Audiovisual Aids

Excellent	47%	(17)
Very Good	36%	(13)
Good	14%	(5)
Fair	0%	(0)
Poor	0%	(0)
N/A	3%	(1)

3g. Syllabus Materials

Excellent	22%	(8)
Very Good	36%	(13)
Good	11%	(4)
Fair	22%	(8)
Poor	0%	(0)
N/A	8%	(3)

Exit Questionnaire (cont'd)

3h. Conference Facilities

Excellent	50%	(18)
Very Good	22%	(8)
Good	14%	(5)
Fair	6%	(2)
Poor	3%	(1)
N/A	6%	(2)

3i. Registration Process

Excellent	42%	(15)
Very Good	36%	(13)
Good	11%	(4)
Fair	6%	(2)
Poor	0%	(0)
N/A	6%	(2)

Question 4.

Do you feel the activity was Objective, Balanced and Free of Commercial Bias?

Yes	92%	(33)
No	3%	(1)
N/A	6%	(2)

Question 5.

This Activity should Improve my:

Medical or Practice Knowledge

Strongly Agree	25%	(9)
Somewhat Agree	25%	(9)
Neutral	17%	(6)
Somewhat Disagree	3%	(1)
Strongly Disagree	8%	(3)
N/A	22%	(8)

Care Attitudes

Strongly Agree	11%	(4)
Somewhat Agree	22%	(8)
Neutral	25%	(9)
Somewhat Disagree	3%	(1)
Strongly Disagree	8%	(3)
N/A	31%	(11)

Procedural or Cognitive Skills

Strongly Agree	28%	(10)
Somewhat Agree	22%	(8)
Neutral	22%	(8)
Somewhat Disagree	3%	(1)
Strongly Disagree	6%	(2)
N/A	19%	(7)

Exit Questionnaire (cont'd)

Practice Behavior

Strongly Agree	8%	(3)
Somewhat Agree	31%	(11)
Neutral	22%	(8)
Somewhat Disagree	3%	(1)
Strongly Disagree	8%	(3)
N/A	28%	(10)

Patients' Clinical Outcomes

Strongly Agree	6%	(2)
Somewhat Agree	25%	(9)
Neutral	31%	(11)
Somewhat Disagree	3%	(1)
Strongly Disagree	8%	(3)
N/A	28%	(10)

Approach to my Research/ Public Health Awareness

Strongly Agree	53%	(19)
Somewhat Agree	31%	(11)
Neutral	3%	(1)
Somewhat Disagree	0%	(0)
Strongly Disagree	0%	(0)
N/A	14%	(5)

**Question 6.
 Please Evaluate the Daily Lectures:**

Evan Dale Abel, MD, PhD

Excellent	31%	(11)
Very Good	22%	(8)
Good	14%	(5)
Fair	0%	(0)
Poor	0%	(0)
N/A	33%	(12)

Christopher P. Baines, PhD

Excellent	31%	(11)
Very Good	25%	(9)
Good	11%	(4)
Fair	0%	(0)
Poor	0%	(0)
N/A	33%	(12)

Robert S. Balaban, PhD

Excellent	33%	(12)
Very Good	17%	(6)
Good	11%	(4)
Fair	3%	(1)
Poor	0%	(0)
N/A	36%	(13)

Exit Questionnaire (cont'd)

Paul S. Brookes, PhD

Excellent	28%	(10)
Very Good	28%	(10)
Good	11%	(4)
Fair	3%	(1)
Poor	0%	(0)
N/A	31%	(11)

David C. Chan, MD, PhD

Excellent	39%	(14)
Very Good	17%	(6)
Good	11%	(4)
Fair	0%	(0)
Poor	0%	(0)
N/A	25%	(12)

Kong Y. Chen, PhD

Excellent	22%	(8)
Very Good	19%	(7)
Good	22%	(8)
Fair	8%	(3)
Poor	0%	(0)
N/A	28%	(10)

Kieran Clarke, PhD

Excellent	36%	(13)
Very Good	17%	(6)
Good	14%	(5)
Fair	3%	(1)
Poor	3%	(1)
N/A	28%	(10)

Fabio Di Lisa, MD

Excellent	22%	(8)
Very Good	28%	(10)
Good	17%	(6)
Fair	6%	(2)
Poor	0%	(0)
N/A	28%	(10)

Roberta A. Gottlieb, MD

Excellent	22%	(8)
Very Good	22%	(8)
Good	22%	(8)
Fair	3%	(1)
Poor	0%	(0)
N/A	31%	(11)

Exit Questionnaire (cont'd)

Daniel P. Kelly, MD

Excellent	28%	(10)
Very Good	19%	(7)
Good	11%	(4)
Fair	6%	(2)
Poor	0%	(0)
N/A	36%	(13)

Thomas Langer, PhD

Excellent	33%	(12)
Very Good	19%	(7)
Good	6%	(2)
Fair	3%	(1)
Poor	0%	(0)
N/A	39%	(14)

W. Jonathan Lederer, MD, PhD

Excellent	19%	(7)
Very Good	22%	(8)
Good	19%	(7)
Fair	6%	(2)
Poor	3%	(1)
N/A	31%	(11)

Jennifer A. Lippincott-Schwartz, PhD

Excellent	36%	(13)
Very Good	17%	(6)
Good	17%	(6)
Fair	0%	(0)
Poor	0%	(0)
N/A	31%	(11)

Gary D. Lopaschuk, PhD

Excellent	25%	(9)
Very Good	11%	(4)
Good	11%	(4)
Fair	0%	(0)
Poor	0%	(0)
N/A	53%	(19)

Vamsi K. Mootha, MD

Excellent	44%	(16)
Very Good	17%	(6)
Good	3%	(1)
Fair	0%	(0)
Poor	0%	(0)
N/A	36%	(13)

Exit Questionnaire (cont'd)

Michael P. Murphy, PhD

Excellent	36%	(13)
Very Good	28%	(10)
Good	8%	(3)
Fair	0%	(0)
Poor	0%	(0)
N/A	28%	(10)

Brian O'Rourke, PhD

Excellent	25%	(9)
Very Good	22%	(8)
Good	22%	(7)
Fair	0%	(0)
Poor	0%	(0)
N/A	33%	(12)

Peipei Ping, PhD

Excellent	22%	(8)
Very Good	14%	(5)
Good	25%	(9)
Fair	3%	(1)
Poor	0%	(0)
N/A	36%	(13)

Rainer Schulz, MD, PhD

Excellent	17%	(6)
Very Good	25%	(9)
Good	28%	(10)
Fair	3%	(1)
Poor	0%	(0)
N/A	28%	(10)

Luca Scorrano, MD, PhD

Excellent	33%	(12)
Very Good	19%	(7)
Good	14%	(5)
Fair	0%	(0)
Poor	0%	(0)
N/A	33%	(12)

Gerald S. Shadel, PhD

Excellent	25%	(9)
Very Good	28%	(10)
Good	8%	(3)
Fair	3%	(1)
Poor	3%	(1)
N/A	33%	(12)

Exit Questionnaire (cont'd)

Sruti Shiva, PhD

Excellent	17%	(6)
Very Good	25%	(9)
Good	14%	(5)
Fair	3%	(1)
Poor	0%	(0)
N/A	42%	(15)

Gerald I. Shulman, MD, PhD

Excellent	44%	(16)
Very Good	25%	(9)
Good	6%	(2)
Fair	0%	(0)
Poor	0%	(0)
N/A	25%	(9)

David A. Sinclair, PhD

Excellent	28%	(10)
Very Good	14%	(5)
Good	3%	(1)
Fair	0%	(0)
Poor	0%	(0)
N/A	56%	(20)

Steven J. Sollot, MD

Excellent	11%	(4)
Very Good	17%	(6)
Good	11%	(4)
Fair	3%	(1)
Poor	0%	(0)
N/A	58%	(21)

Bruce M. Spiegelman, PhD

Excellent	44%	(16)
Very Good	14%	(5)
Good	6%	(2)
Fair	0%	(0)
Poor	0%	(0)
N/A	36%	(13)

William C. Stanley, PhD

Excellent	11%	(4)
Very Good	14%	(5)
Good	14%	(5)
Fair	0%	(0)
Poor	0%	(0)
N/A	58%	(21)

Exit Questionnaire (cont'd)

Charles J. Steenbergen, JR., MD, PhD

Excellent	25%	(9)
Very Good	19%	(7)
Good	19%	(7)
Fair	0%	(0)
Poor	0%	(0)
N/A	36%	(13)

Rong Tian, MD, PhD

Excellent	22%	(8)
Very Good	17%	(6)
Good	25%	(9)
Fair	0%	(0)
Poor	0%	(0)
N/A	36%	(13)

Jennifer Van Eyk, PhD

Excellent	22%	(8)
Very Good	31%	(11)
Good	14%	(5)
Fair	3%	(1)
Poor	0%	(0)
N/A	31%	(11)

Hugh Watkins, MD, PhD

Excellent	17%	(6)
Very Good	28%	(10)
Good	8%	(3)
Fair	3%	(1)
Poor	0%	(0)
N/A	44%	(16)