The Intersection of Nutrition and Genetics

Beverly K. Jordan, MPA
Director of Community Outreach
The Intersection of Nutrition and Genetics

Objectives

• Learn about the work happening at the new UNC-Chapel Hill Nutrition Research Institute (NRI) located on the North Carolina Research Campus in Kannapolis, NC.

• Share the NRI’s vision for creating individualized nutrition recommendations to optimize health and wellness.

• Explore recent advances in science that provide insight into why individuals vary in their metabolism and nutrient requirements.

• Understand how discovery at the NRI is already being used to prevent disease and improve health.
Disclaimers:

1. Science = Complicated

2. Not a Scientist!

3. All scientific information provided courtesy of NRI Director.
The Scientist:

Dr. Steven H. Zeisel, MD, PhD

steven_zeisel@unc.edu
NRI Institute Director
Kenan Distinguished Professor of Nutrition and Pediatrics
UNC-Chapel Hill
North Carolina Research Campus
North Carolina Research Campus

350 acre campus
NCRC Partners
Economic Impact

State of NC providing more than $30 million/yr to fund UNC system efforts on the campus.

“Jim, this is Ms. Hurdle, Mr. Obstacle, and Ms. Brick-Wall. They’re interested in your big idea.”
UNC – Chapel Hill’s Part
UNC Nutrition Research Building

- 125,000 Square Feet
- UNC-Chapel Hill to operate 101,000 square feet
Vision for UNC Nutrition Research Institute

Enhance human health by using individual genetic & metabolic variations to develop nutrition solutions that target individual susceptibilities and differences.
We evolved to eat so differently...
Guidelines for Proper Nutrition
Guidelines for Proper Nutrition

“I must be eating right. I’m narrow at the top and wide at the bottom, just like the food pyramid.”
And we know that people are very different
Still, we assume people are average

Level of intake to meet requirement

Optimal function

Average requirement

Rx with nutrient
60% show no effect
40% show effect
Statistics = null effect

Still, we assume people are average
Advantage of identifying metabolic individuality

Average requirement

Level of intake to meet requirement

Optimal function

nonresponder

responder

Rx with nutrient
60% show no effect
40% show effect
Statistics = significant responders
New Biotechnology

Nutrigenomics

Metabolomics
Nutrigenomics

- Identical genes, different expression.

Once thought genes were fixed.
Now know that genes may be influenced by a variety of factors (Epigenetics).
Nutrigenomics

- Intersection of nutrition and genetics
- Explores how food we eat turn on and off light switches of genetic expression.
- Salt

"Didn't the medicine man tell you to avoid salty snacks?"
Metabolomics
Metabolomics

Swanson MG, et al. MRM 50:944, 2003
Single measures may not provide full picture

Thousands of metabolites and thousands of genes, functional markers, behaviors.
Layering scientific methods of nutrigenomics and metabolics creates tools to make individualized nutrition possible.

We will be able to custom tailor diet for optimal health and wellness.
NRI Research Teams and Infrastructure

NRI Research Teams
18 Faculty Members and Their Staff

Supporting Staff Positions

Jobs in Community (office supplies, scientific supplies, food, maintenance, grounds keeping, information technology, etc.)

NRI Faculty and Staff at full capacity: 250 people
NRI Discovery in Nutrition Science
(proof that it IS your Mother’s fault)

- Nutrient recognized but thought to do nothing.
- Turns out to be critical, especially for brain development.

---

**CHOLINE CONTENT per serving**

- Beef Liver, 85 g (3 oz) 355.5 mg
- Egg, 50 g (1 large) 125.5 mg
- Beef Steak, 85 g (3 oz) 66.4 mg
- Cauliflower, 99 g (1/6 medium head) 38.7 mg
- Wheat Germ, 14 g (2 Tbsp) 21.3 mg
- Peanuts, 30 g (1 oz) 15.8 mg
- Iceberg Lettuce, 89 g (1/6 medium head) 6.0 mg

Values taken from the USDA Database for the Choline Content of Common Foods, prepared in collaboration with Steven H. Zeisel MD, PhD and Mei-Heng Mar, March 2004.
Discovery in Nutrition Science
(proof that it IS your Mother’s fault)

77% of men

80% of postmenopausal women,

44% of premenopausal women

Need to eat choline.

Why do some premenopausal women have a decreased dietary requirement for choline?
Discovered that ability to make choline in the liver is induced by estrogen.
NRI Discovery in Nutrition Science
(proof that it IS your Mother’s fault)
Pattern of metabolites predict the occurrence and severity of coronary artery disease using blood plasma.

Cutting Edge of Discovery: Obesity (Epigenetics)
Cutting Edge of Discovery: Obesity (Epigenetics)

Many reasons for epidemic:

- Flora activity and affect on metabolism
  - Bacteria vs. Human Cells
- Mother’s diet during pregnancy
  - Epigenetic changes last up to 3 generations
Optimizing Your Health, One Mouthful At a Time
Frontiers in Nutrition

Community Outreach

Cooking School
Help us navigate a course to the next frontier in nutrition

Visionaries Needed!
- NRI Great Minds
- Faculty Recruitment Funds
- Lab Start Up Funds
- Endowed Fellowships
- Naming Opportunities
- Event Sponsorship