



**Pennington Biomedical
Research Center**
Louisiana State University



Be the Reason

Annual Childhood Obesity Conference

Powered by Pennington Biomedical Research Center in partnership with the State of Louisiana.
© 2025 The Board of Supervisors of Louisiana State University and Agricultural and Mechanical College. All rights reserved.

Keynote Presentation

Precision Nutrition: Where We Are and Where We're Headed

Presented by: Jacob Mey, PhD

Be the Reason: Annual Childhood Obesity Conference



Presentation Overview

Introduction

What is Precision Nutrition?

Precision Nutrition in Practice

Clinical Example: Hypertension

Current Applications & Resources

Emerging Areas & Future Thoughts

Pennington Biomedical Research Center

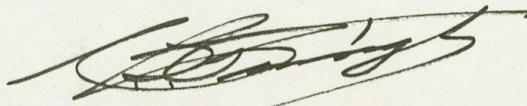


C.B. "Doc" Pennington and his wife
Irene Wells Pennington

MEMO

From the desk of ...
C.B. PENNINGTON

IN FORMULATING THE
ORIGINAL FOUNDATION,
MY ONLY INSTRUCTIONS
WERE THAT THIS SHOULD BE
THE BIGGEST AND BEST
NUTRITION RESEARCH CENTER
IN THE COUNTRY.


4/21/83

What is Precision Nutrition?

Precision Nutrition

Personalized approach to diet prescription

- Foundational nutrition guidelines
- Adjusted for:
 - Health goal
 - Individual biology
 - Food preferences & lifestyle

Why?

- Optimize health & sustainability

CRITICAL: utilize data-driven practices:

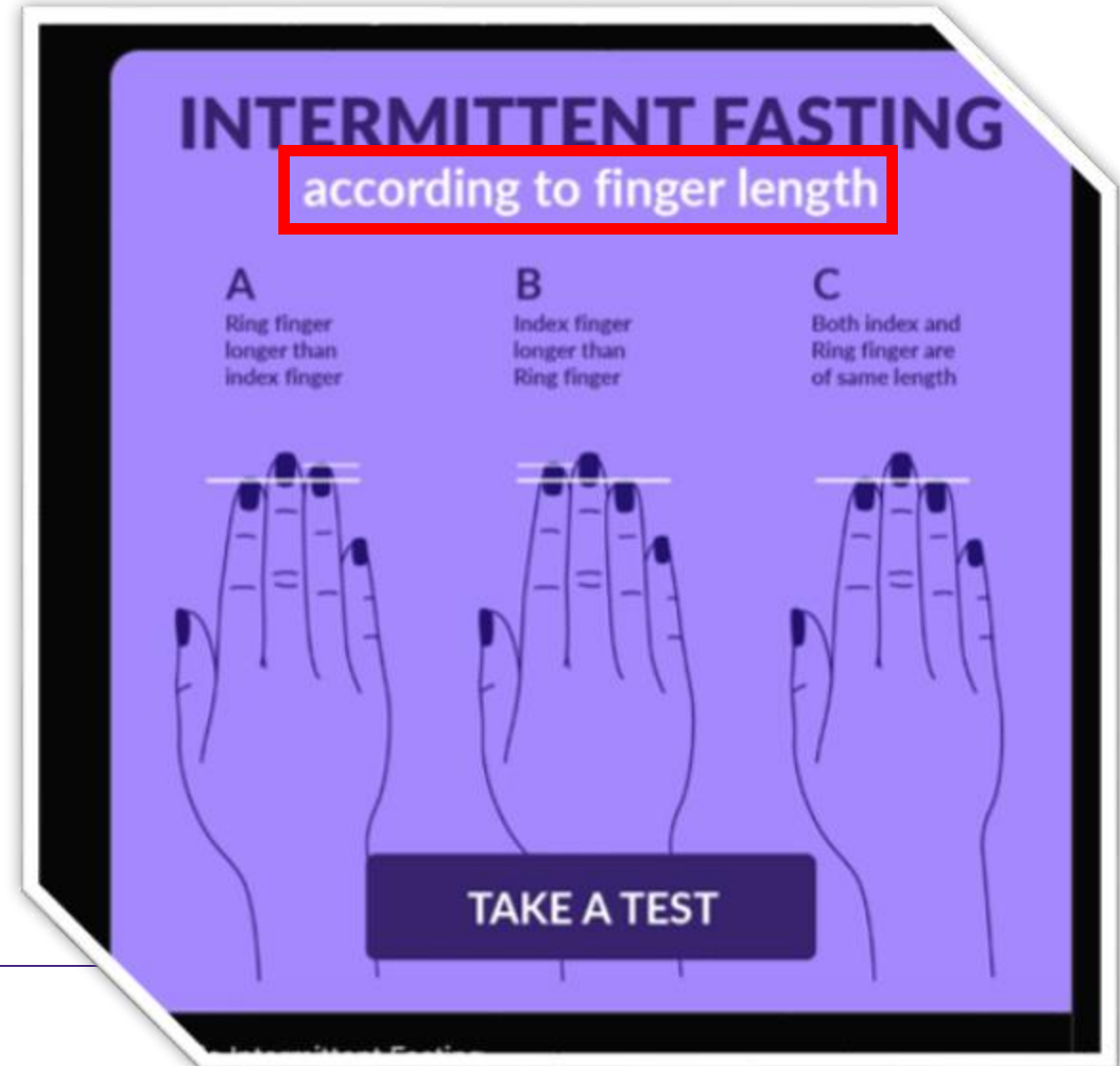
- targeted genetic testing
- metabolic assessments
- blood & urine biomarkers
- mobile device monitoring
- standardized clinical testing



A quick word of caution:
Nutrition misinformation is rampant.



This is NOT precision nutrition

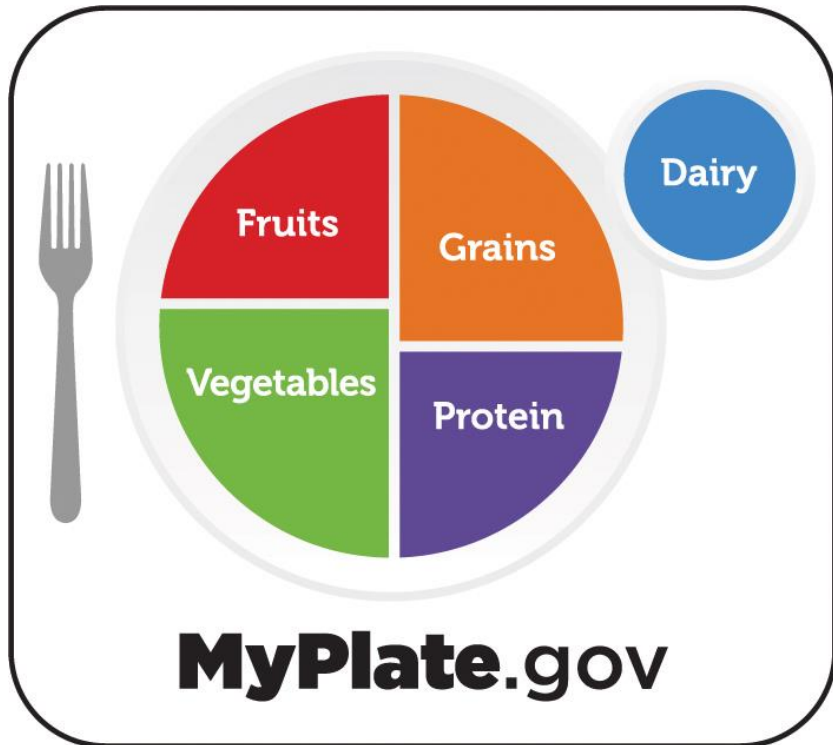


Precision Nutrition in Practice

Precision Nutrition

Level 1: Foundational Nutrition

Start Here



Probiotics:

Micro-organisms

- Contribute to gut microbiome
- Fermented foods
 - Greek yogurt, sauerkraut, pickles
 - Kefir, kimchi, kombucha, miso

Prebiotics:

Feed gut microbiome

- Typically, indigestible portions of food
- >30 different species of plant foods per week
 - Fruits, veggies, grains, legumes, seeds, nuts



Precision Nutrition

Level 2: Choose an Evidence-based Menu Plan for Primary Goal



Diabetes Prevention Program

The New England Journal of Medicine

Copyright © 2002 by the Massachusetts Medical Society

VOLUME 346

FEBRUARY 7, 2002

NUMBER 6



REDUCTION IN THE INCIDENCE OF TYPE 2 DIABETES WITH LIFESTYLE INTERVENTION OR METFORMIN

DIABETES PREVENTION PROGRAM RESEARCH GROUP*



Dietary Approaches to Stop Hypertension

The New England Journal of Medicine

© Copyright, 1997, by the Massachusetts Medical Society

VOLUME 336

APRIL 17, 1997

NUMBER 16



A CLINICAL TRIAL OF THE EFFECTS OF DIETARY PATTERNS ON BLOOD PRESSURE



A quick word of caution:
Commercialized precision nutrition
misinformation is rampant.



- 1) Need quality genetic testing
- 2) Ensure quality data support recommendations



Registered dietitians are ***THE*** food & nutrition experts.

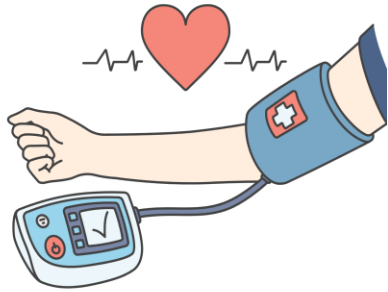
KNOWLEDGE + IMPLEMENTATION + SUPPORT

- Provide ***evidence-based advice*** tailored to your needs.
- Trained in ***behavior change*** and ***motivational*** techniques.
- Human-to-human ***support & monitoring*** for sustainability.



A Clinical Example

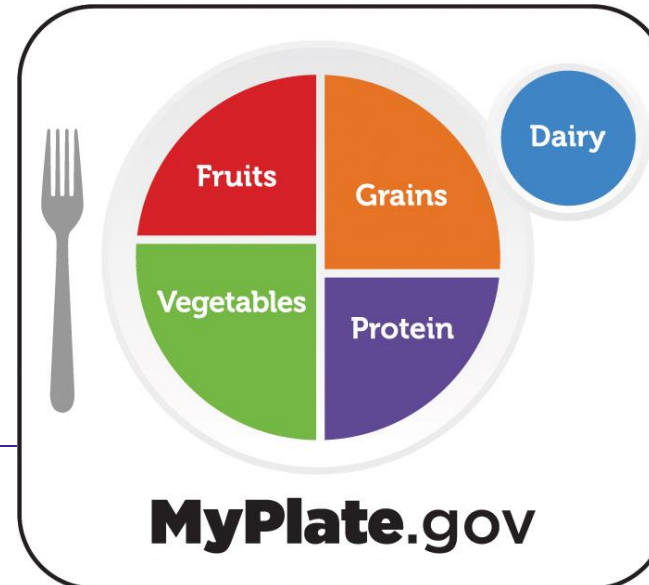
Patient needs to lower blood pressure.



Patient wants to
reduce blood
pressure (BP)



Nutrition *SUPPORTS*
standard of care
medical approaches.



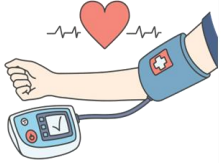
“In addition to”

NOT

“In place of”

Precision Nutrition

Level 2: Choose an Evidence-based Menu Plan for Primary Goal



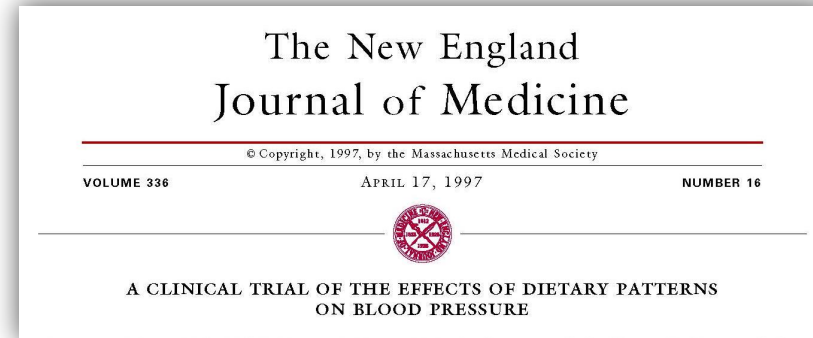
Patient wants to reduce blood pressure (BP)

In addition to foundational nutrition goals:

- Focus on fat-free or low-fat dairy products
- Focus on lean meats or shift to poultry and fish
- Limit saturated fat intake to <6% of calories
 - 13 grams of saturated fat on a 2000kcal diet
- Limit sodium intake to <2300 mg/day
 - ~1500 mg/day goal
 - Use low-sodium versions of foods
 - Minimize table salt



Dietary Approaches to Stop Hypertension



The New England Journal of Medicine

© Copyright, 1997, by the Massachusetts Medical Society

VOLUME 336

APRIL 17, 1997

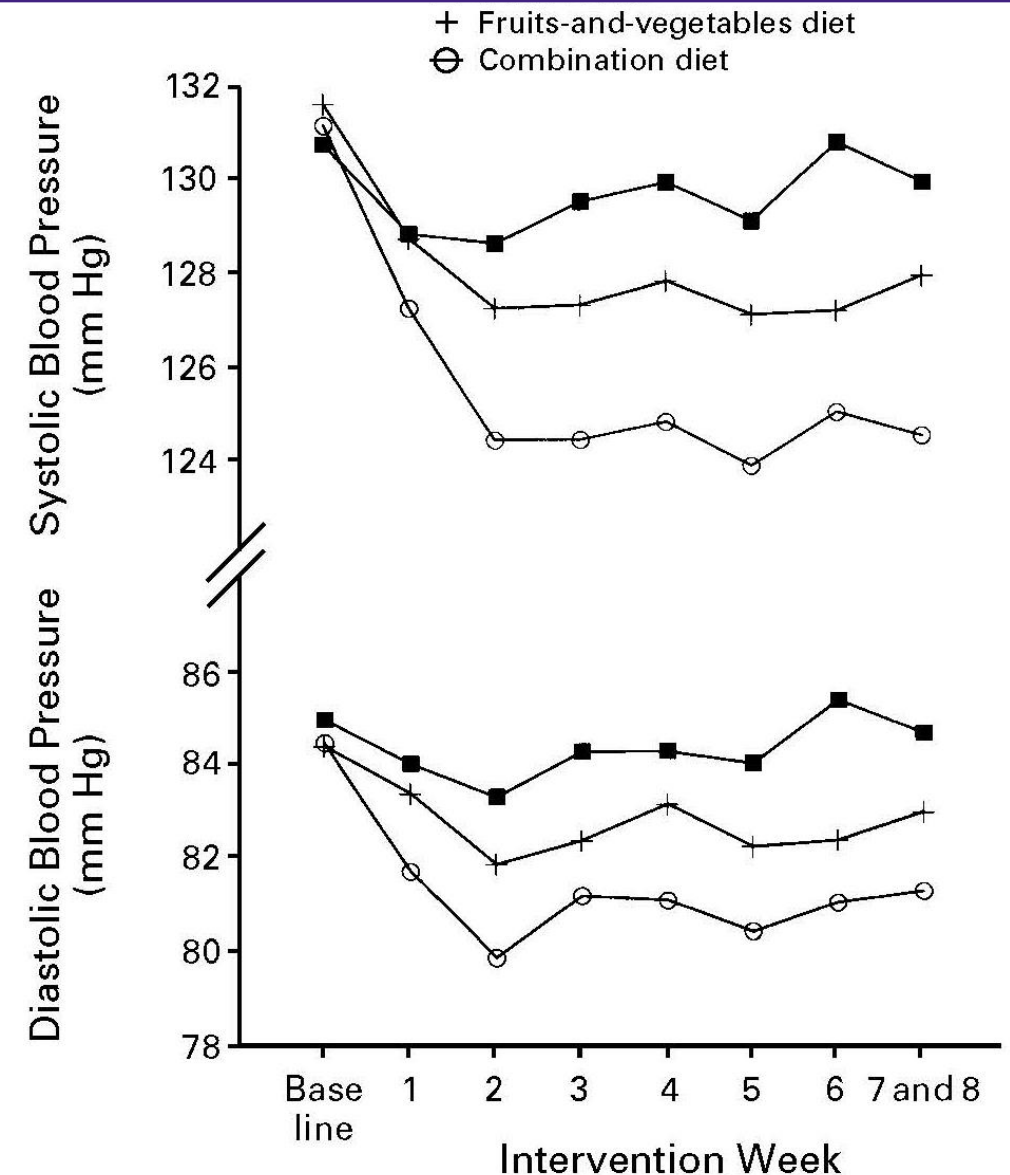
NUMBER 16



A CLINICAL TRIAL OF THE EFFECTS OF DIETARY PATTERNS ON BLOOD PRESSURE

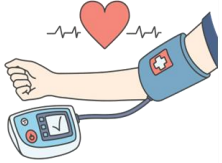
DASH Diet reduces systolic & diastolic blood pressure

Results are MORE impactful for people with hypertension! (high blood pressure; >140/90)



Precision Nutrition

Level 3: Incorporating Genetics and Advanced Biometrics



Patient wants to reduce blood pressure (BP)

ADORA2A, ADRA2B

Regulates BP response to caffeine

- Gene variants: BP may increase in response to ~200 mg caffeine

MTHFR 677TT

Genetic variant: reduced effect of BP meds & ↑ heart disease risk

- **Riboflavin supplementation** independently lowers BP

pb



CYP1A2

Metabolizes caffeine

- Variant for slow caffeine metabolism: ↑ heart attack risk with 2+ cups/day



Add **coffee limit**
2 cups/day



Add daily **Riboflavin**
supplement

Precision Nutrition

Level 4: Expert Dietetic Insight & Support



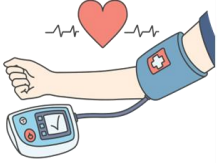
Patient wants to reduce blood pressure (BP)

- Strategies & tactics to implement changes
- Support to overcome barriers
- Pre-emptive plans for holidays, travel, etc



	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Breakfast	 Smoked Oyster & Sun Dried Tomato... ...	 Peanut Butter & Apple Toast with... ...	 Turmeric Eggs & Spinach on Toast ...	 Turmeric Eggs & Spinach on Toast ...	 Smoked Oyster & Sun Dried Tomato... ...	 Apple & Sweet Potato Hash ...	 Apple & Sweet Potato Hash ...
Snack 1	 Yogurt with Apple & Walnuts ...	 Blueberries & Walnuts ...	 Pumpkin Seeds ...	 Greek Yogurt & Blueberries ...	 Peanut Butter Toast & Fruit Snack Box ...	 Blueberries & Walnuts ...	 Greek Yogurt & Blueberries ...
Lunch	 Warm Lentil & Sweet Potato Salad ...	 Warm Lentil & Sweet Potato Salad ...	 One Pan Everything Salmon & Brussels... ...	 Roasted Chicken, Beets & Brussel... ...	 Salmon & Roasted Root Veggie Salad ...	 Roast Chicken with Butternut Squash ...	 Saucy Lentils & Eggs ...
Snack 2	 Peanut Butter & Blueberry Toast ...	 Smoked Oysters, Apple & Brazil Nuts ...	 Peanut Butter Toast & Fruit Snack Box ...	 Smoked Oysters, Apple & Brazil Nuts ...	 Walnuts ...	 Toast with Peanut Butter ...	 Peanut Butter & Apple Toast with... ...

- Meal preparation
- New recipes
- Seasonal variety
- Changing tastes
- Culture & food preferences



Patient wants to reduce blood pressure (BP)

Integrate emerging research findings!
Empower patient decision-making!



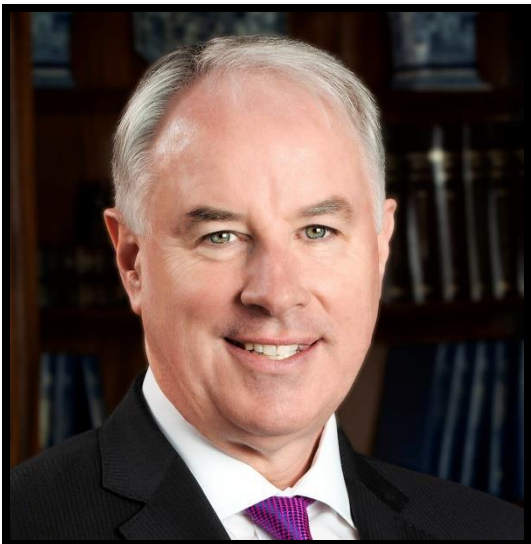
Add goal: 50g whole-grains per 1000 kcal intake.



The Journal of Nutrition
Nutrition and Disease

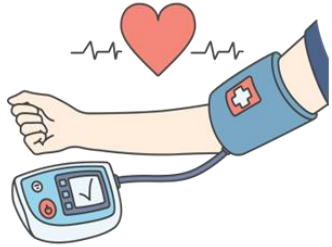
A Whole-Grain Diet Reduces Cardiovascular Risk Factors in Overweight and Obese Adults: A Randomized Controlled Trial¹⁻³

John P Kirwan,^{4,6*} Steven K Malin,⁴ Amanda R Scelsi,⁴ Emily L Kullman,⁴ Sankar D Navaneethan,⁵ Mangesh R Pagadala,⁶ Jacob M Haus,⁴ Julianne Filion,⁴ Jean-Philippe Godin,⁷ Sunil Kochhar,⁷ and Alastair B Ross^{7,8}



Precision Nutrition

Level 4: Expert Dietetic Insight & Support

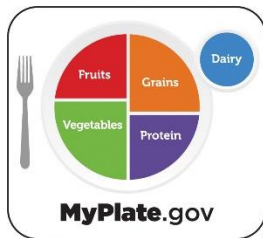


Patient wants to reduce blood pressure (BP)

LEVEL 1



Medical interventions & standard nutrition advice.



LEVEL 2



- Add saturated fat limit of <6% of total calories
- Add sodium goal of ~1500 mg/day

LEVEL 3



- Add coffee limit of 2 cups/day
- Add daily B2 supplement

LEVEL 4



- Add whole-grain goal of 50g/1000 calories

Current Applications & Resources

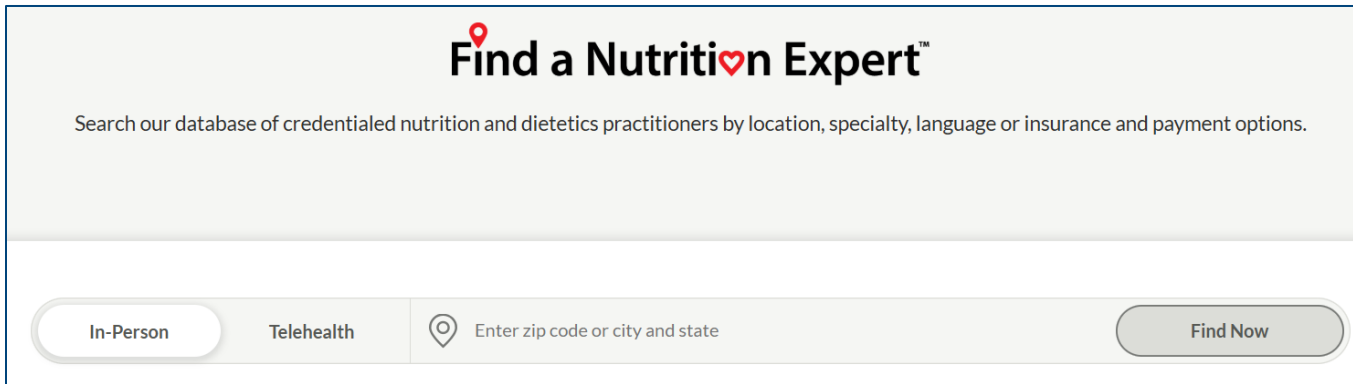
Precision Nutrition Approaches can be Implemented TODAY for:

- Hypertension
- Obesity
- Diabetes/Pre-diabetes
- Chronic Kidney Disease
- Select inborn errors of metabolism
- ... Others are emerging

How can YOU find an expert precision nutrition registered dietitian?

Resources:

<https://www.eatright.org/find-a-nutrition-expert>



Pennington has a clinic for obesity, prediabetes & diabetes!
225-763-0250 or endocrinology@pbrc.edu

Connect with Academy Practice Groups or the Louisiana State Affiliate.

wmdpg@quidnunc.org; LAND@eatright.org;
Jacob.Mey@pbrc.edu

Key factors to selecting an RD for you or your practice.

- **Interview them** – make sure they align with your goals.
- RD's specialize like other professions
- RDs specialties: Vegan, ketogenic, diabetes, renal, etc
- Find a Precision Nutrition RD!

Where we're headed

Nutrition for Precision Health Study



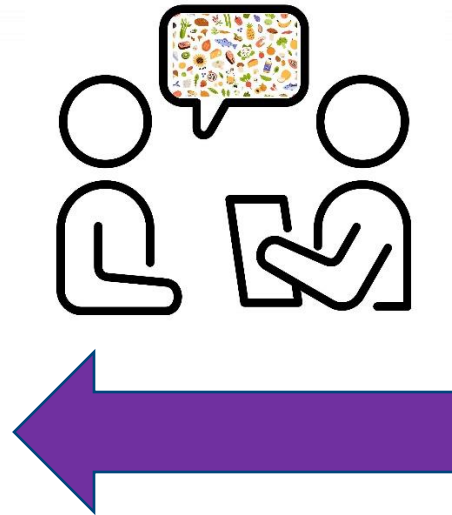
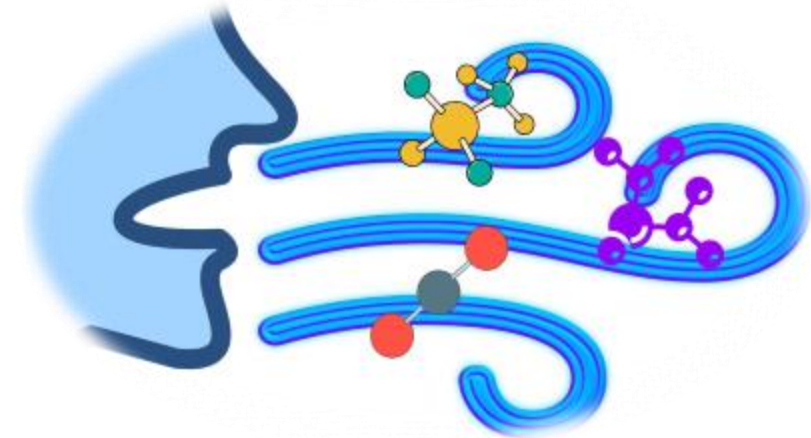
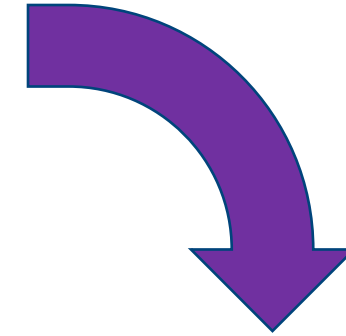
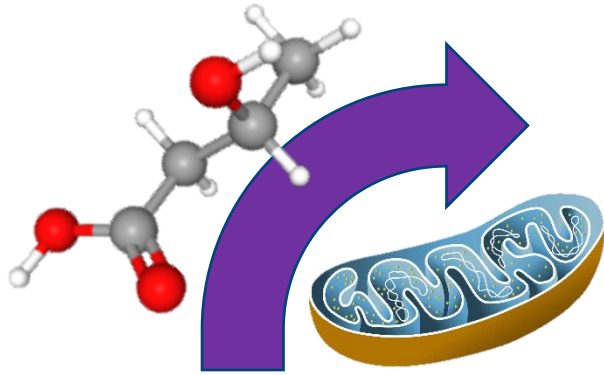
The **Nutrition for Precision Health** study is researching how nutrition can be tailored to each person's **genes**, **culture**, and **environment** to improve **health**.

<https://nutritionforprecisionhealth.org/>



PrecISE, or the Precision Interventions for Severe and/or Exacerbation-Prone Asthma Network, is a precision medicine trial with a **nutrition arm**.

MENU Lab : Precision Nutrition & the Pulmonary System



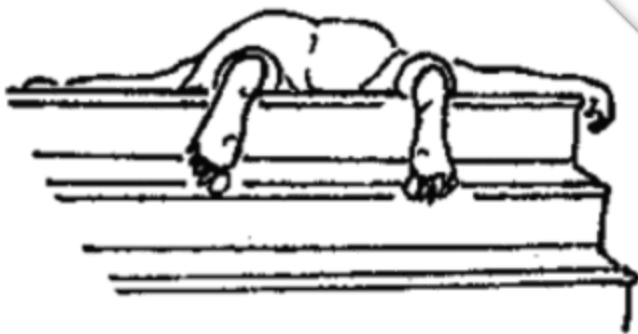
Breath Volatile Organic Compounds (VOC)

PROMISING INVESTIGATOR AWARD

aspen
LEADING THE SCIENCE AND
PRACTICE OF CLINICAL NUTRITION
American Society for Parenteral and Enteral Nutrition

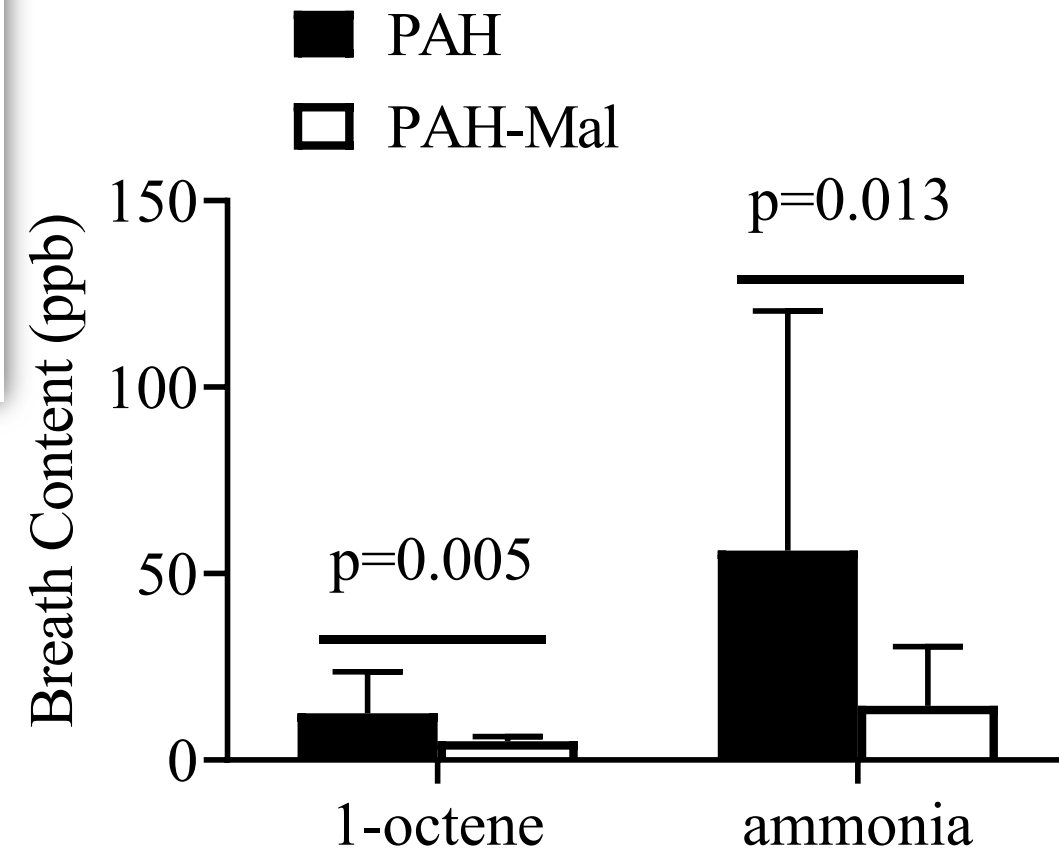
The breath print represents a novel biomarker of malnutrition in pulmonary arterial hypertension: A proof of concept study

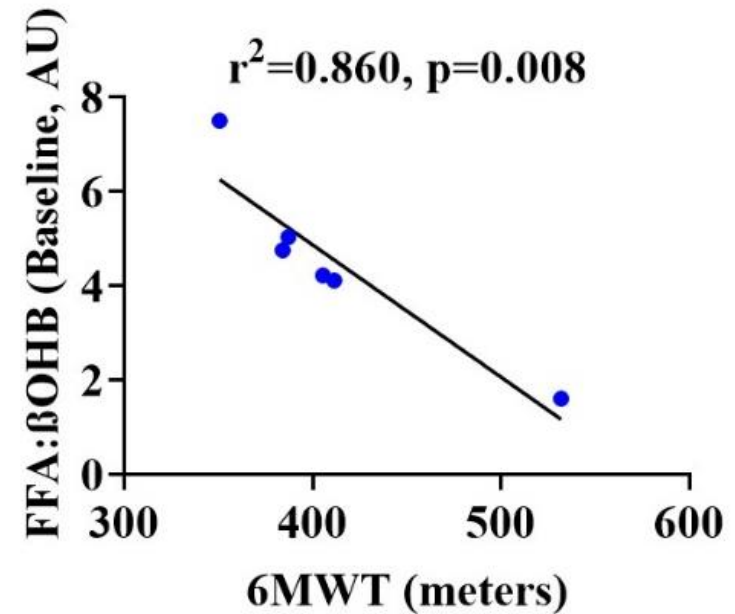
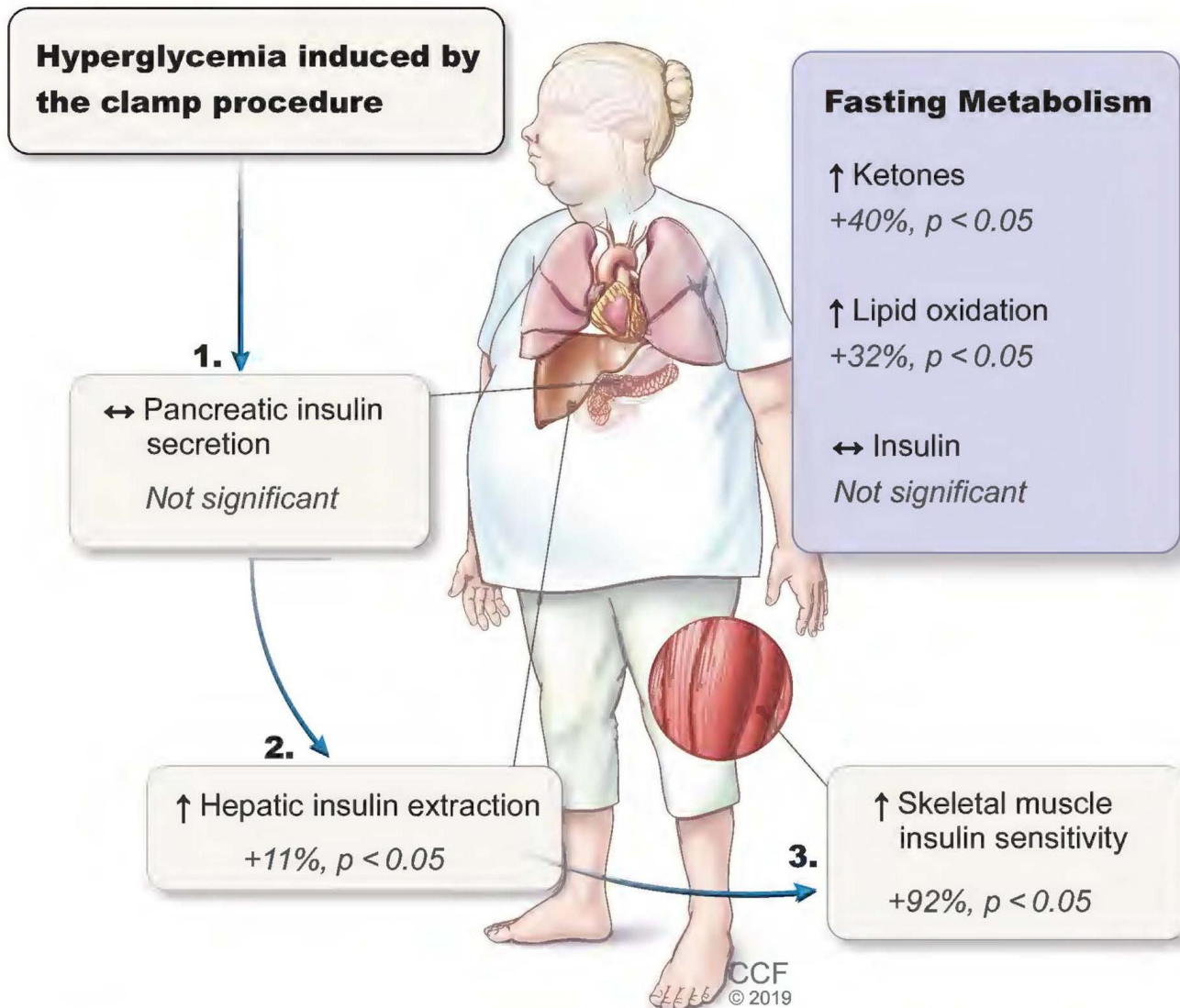
Jacob T. Mey PhD, RD¹  | Mary C. Rath MEd, RD² | Kathleen McLaughlin RD²  |
Marianne Galang RD² | Kathryn Lynch RD² | Jaime DiMattio RD² |
Hillary Nason RD^{2,3}  | Shengping Yang PhD¹ | Celia A. Melillo BS⁴ |
David E. Grove PhD⁴ | Adriano R. Tonelli MD⁵  | Gustavo A. Heresi MD⁵  |
John P. Kirwan PhD¹  | Raed A. Dweik MD⁵ 



THE "TOP-OF-THE-STAIRS" PLOP

Pulmonary Arterial
Hypertension (PAH)





More ketogenic metabolism was related to better clinical outcomes.

Published in final edited form as:

Eur Respir J. 2020 April ; 55(4): . doi:10.1183/13993003.01700-2019.

Lipids and Ketones Dominate Metabolism at the Expense of Glucose Control in Pulmonary Arterial Hypertension: A Hyperglycemic Clamp and Metabolomics Study

Jacob T. Mey^{1,2}, Adithya Hari², Christopher L. Axelrod^{1,2,3}, Ciarán E. Fealy^{2,4,5}, Melissa L. Erickson^{1,2}, John P. Kirwan^{1,2,5}, Raed A. Dweik^{2,6}, Gustavo A. Heresi^{2,6}

Ketogenic Diet Formulations

Comprehensive, nutrient-dense, high variety vs “Bacon, Butter & Beef”

Research-grade vs lay; fully provisioned vs self-selected; metabolic ward vs free-living



VS



Gardner CD J Am Med Assoc 2018; Am J Clin Nutr 2022

Lennerz Curr Dev Nutr 2022

Keto-“Carnivore”

Self-reported food intake of long-term “Carnivore” dieters

TABLE 2 Frequency of food intake¹

Food class	n	Intake frequency, %							
		Each meal	≥Daily	>Weekly	Weekly	>Monthly	Monthly	<Monthly	Never
Meat									
Red meat, nonpork	2027	39	46	14	0.3	0.3	0.1	0.2	0.1
Pork	2005	2	11	38	15	11	9	8	7
Poultry	2007	0.5	2	20	18	18	14	19	8
Seafood, fish	2015	0.5	3	17	19	19	15	19	7
Seafood, nonfish	2014	0.1	0.7	8	11	16	17	27	20
Organ meat	2017	1	5	18	18	14	10	14	20
Processed meats	2020	0.1	3	16	11	16	12	20	22
Dairy									
Eggs	2023	7	37	33	4	5	4	4	5
Dairy, nonmilk	2023	7	36	24	5	7	4	5	11
Dairy, milk	2009	0.9	8	6	2	4	4	10	65
Nuts	2020	0.1	1	5	3	5	8	14	64
Fruits/vegetables									
Vegetables, nonstarchy	2021	0.0	0.5	2	3	3	5	17	69
Vegetables, starchy	2024	0.0	0.1	1	2	2	4	17	74
Legumes	2018	0.0	0.0	0.0	0.3	0.3	1	9	89
Fruit	2018	0.1	0.7	2	2	3	6	20	66
Grains	2016	0.0	0.1	0.6	1	2	4	14	79
Sugars									
Sugar	2017	0.0	0.7	1.0	1	2	4	13	78
Honey	2013	0.1	1	2	2	3	4	14	74
Noncalorie sweeteners	2017	0.7	9	7	3	4	4	8	65
Miscellaneous									
Exceptions ²	2027	0.3	1	5	9	10	11	31	33
Multivitamin usage	1988	0.7	8	3	1	1	0.9	4	80
Other vitamin usage	1706	2	29	11	2	3	1	5	47

¹Participants were asked to report intake frequency of the listed food groups and items on an 8-point scale. For visualization, the response frequencies are color-coded dark gray if ≥70%, with increasing brightness if 40%–69%, 20%–39%, 10%–19%, 5%–9%, 1%–4%, and <1%.

²Frequency of making exceptions from the carnivore diet.

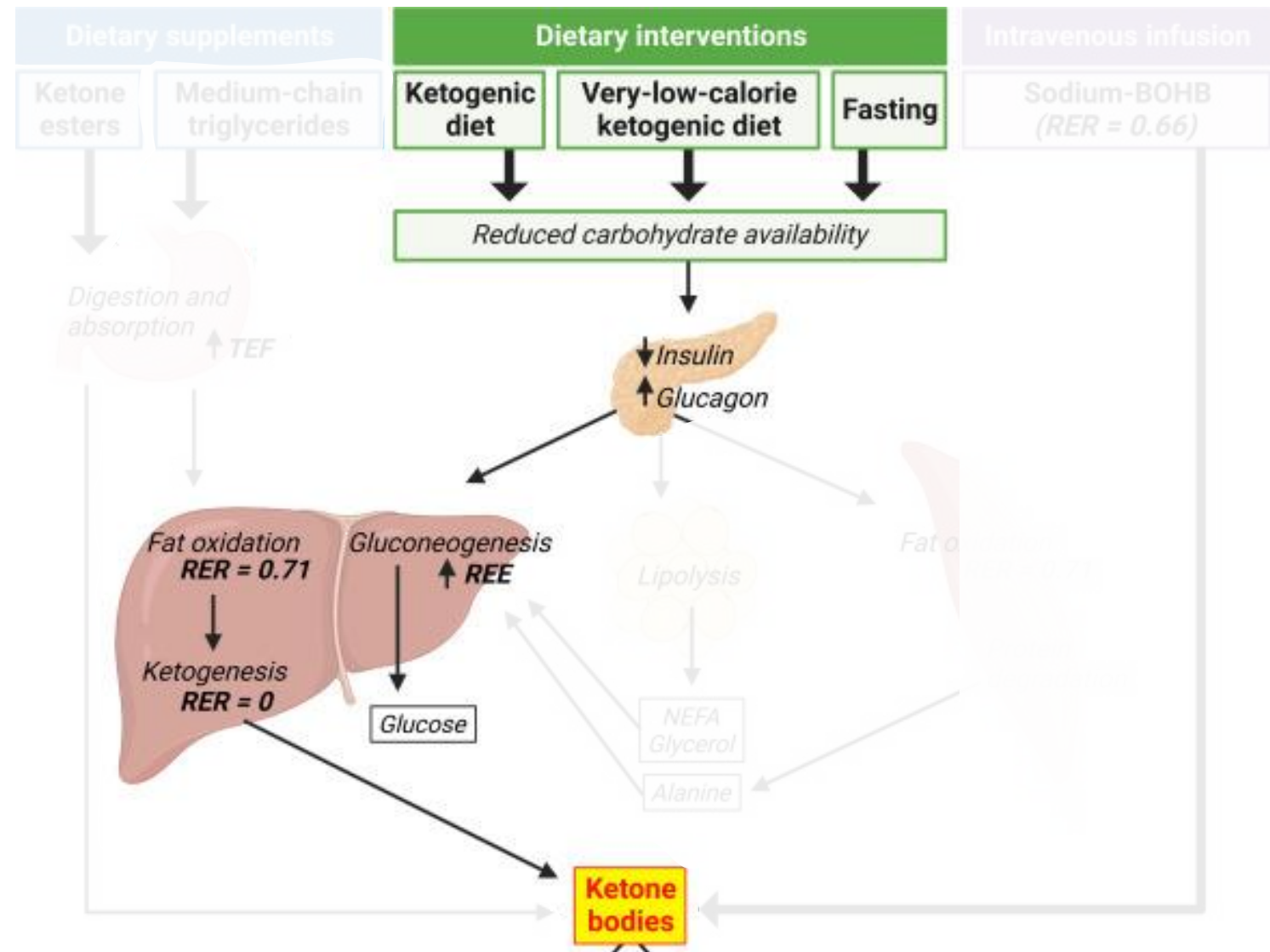
Lennerz Curr Dev Nutr 2022

Be the Reason: Annual Childhood Obesity Conference



Ketogenic Approaches

- Multiple ketogenic therapies available
- Function through **distinct** mechanisms
- Diabetes, cancer, obesity?



Metabolic Milieu

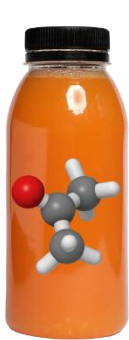
	Exogenous Ketones	MCT-Modified Diet	Ketogenic Diet
Compared to Western/CHO Diet			
↑ circulating ketones	✓	✓	✓
↑ hepatic ketogenesis	-	✓	✓
↑ circulating lipids	-	-	✓

JLR REVIEW

Effects of ketone bodies on energy expenditure, substrate utilization, and energy intake in humans

Rodrigo Fernández-Verdejo^{1,2}, Jacob T. Mey¹, and Eric Ravussin^{1,2}

¹Pennington Biomedical Research Center, Louisiana State University, Baton Rouge, LA, USA; ²Laboratorio de Fisiología del Ejercicio y Metabolismo (LABFEM), Escuela de Kinesiología, Facultad de Medicina, Universidad Finis Terrae, Santiago, Chile



Exogenous Ketones



Medium Chain Triglyceride (MCT)

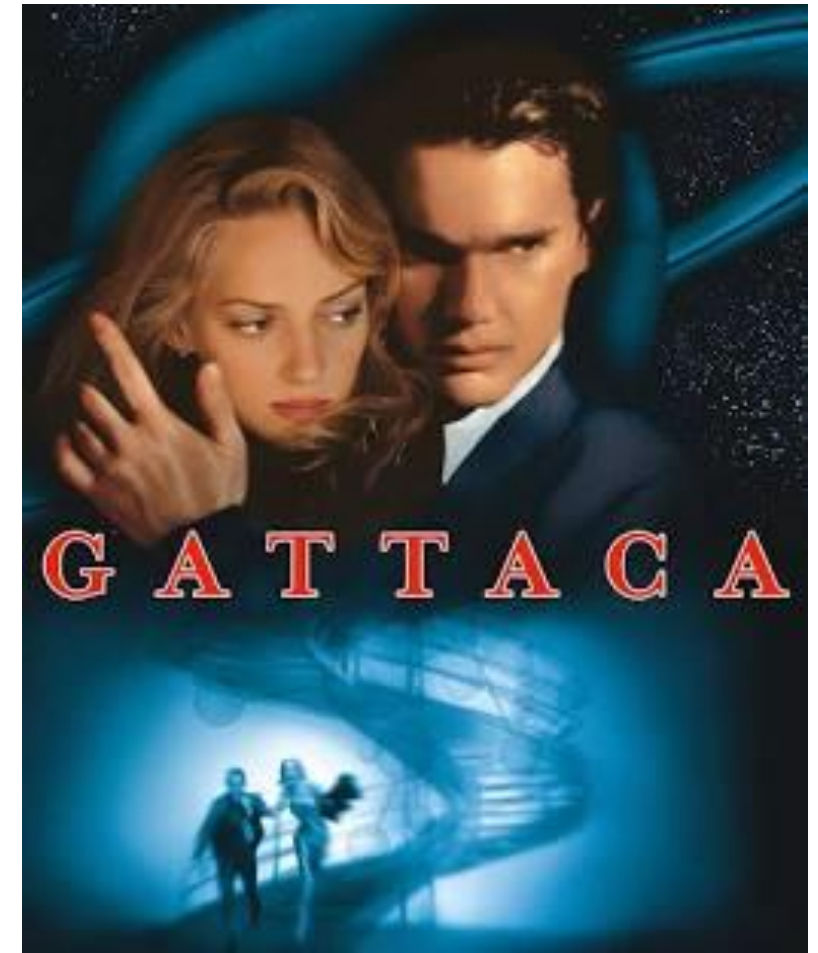


Ketogenic Dietary Pattern

CHO = carbohydrate

Where we're headed

- More evidence-based diets
- Expanded disease-applications
- Advancing genetic relationships
- Novel biometrics
- Precision medicine → adding nutrition to treatment algorithms.



Acknowledgements



Integrated Physiology & Molecular Medicine Lab

John Kirwan
Gangarao Davuluri
Wagner Dantas
Chris Axelrod
Kathryn Belmont
Bolor Vandanmagsar
Elizabeth Zunica
Elizabeth Heintz
Charles Taucer



Cleveland Clinic Respiratory Institute

Raed Dweik
Gustavo Heresi
Adriano Tonelli
David Grove
Celia Melillo
Serpil Erzurum
Anny Mulya

Cleveland Clinic Center for Human Nutrition

Gail Cresci
Naomi Barber
Research Committee Members

Grants & Other Support

5T32AT004094
U54GM104940
UL1RR024989
K01HL169491

Morrison-Cleveland Clinic
Nutrition Research
Collaborative



Giovanni Piedimonte



National Heart, Lung,
and Blood Institute



LSU-LIFT²





**Pennington Biomedical
Research Center**
Louisiana State University

**Greaux
Healthy** 
Pennington Biomedical

Thank you for Investing in our Children's Future



Reach out to me at any time!

Jacob.Mey@pbrc.edu
@cakenutrition

Powered by Pennington Biomedical Research Center in partnership with the State of Louisiana.
© 2025 The Board of Supervisors of Louisiana State University and Agricultural and Mechanical College. All rights reserved.