



# **Vegetarian Nutrition**

a dietetic practice group of the

## **Academy of Nutrition and Dietetics**

*Experts in Plant-Based Nutrition*

Using Nutrigenomic Testing  
to Drive Healthy  
Dietary Choices

Presented by  
Ginger Hultin MS RDN

NDAND Nutrition Symposium -  
Nourishing Health

March 11, 2021

# Objectives

- Determine how to use nutrigenomic direct-to-consumer testing in your practice to benefit client behavior change.
- List the limitations in current genomic research.
- Identify the additional training you may need before utilizing genomic testing in practice.

# Overview



Background



Academy Position update



Genomic information/terminology/review



Client communications



Direct to consumer testing



Research on specific genes



Using genomics in practice



Limitations and legal considerations

# Ginger Affiliations/About

*Champagne Nutrition®* virtual private practice

*Seattle Cancer Nutritionist* virtual private practice

Bastyr University Clinical Faculty

Arivale 2015-2019

FNCE 2019: *Unlocking Precision Nutrition Care: is genetic information the key?*



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## Genomics Background

Nutrigenomics is very new

The Human Genome Project was completed in 2003

Cost continues to decrease as we explore how environmental factors (food intake and lifestyle) influence gene expression

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Precision medicine and personalized care is in demand:

*How can dietitians use it now and what will this mean for our profession in the future?*

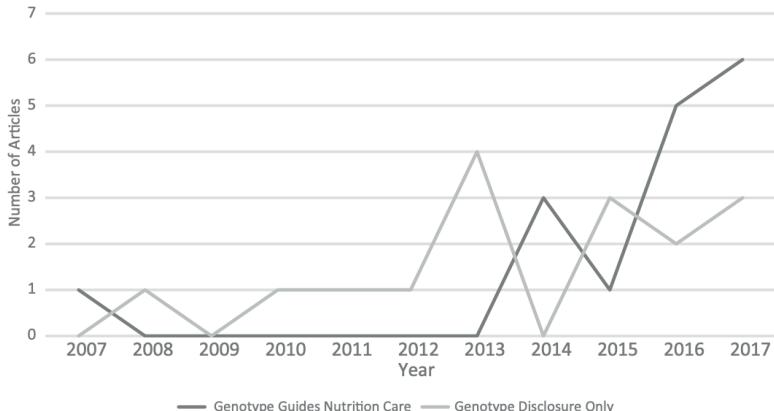
# The Academy Nutrigenomics Position

- 2014 Academy of Nutrition and Dietetics position paper (now unavailable) stated:
  - *Nutritional genomics provides insight into how diet and genotype interactions affect phenotype.*
  - *Because gene expression is constantly interacting with the changing environment, it is not possible to counsel patients using genetic information alone.*
- 2018 Academy's EAL did a scoping review and concluded a systematic review was warranted!

# Nutritional Genomics in Precision Nutrition: An Evidence Analysis Center Scoping Review

Mary Rozga, PhD, RDN; Deepa Handu, PhD, RDN

**Figure 3.** Overview of included studies: Study design and publication status.



**Figure 4.** Trends in publication of articles examining the effect of utilizing nutritional genomics in nutrition practice (N=32).

# Genomics Review

Remember biology class?

# Definitions 101

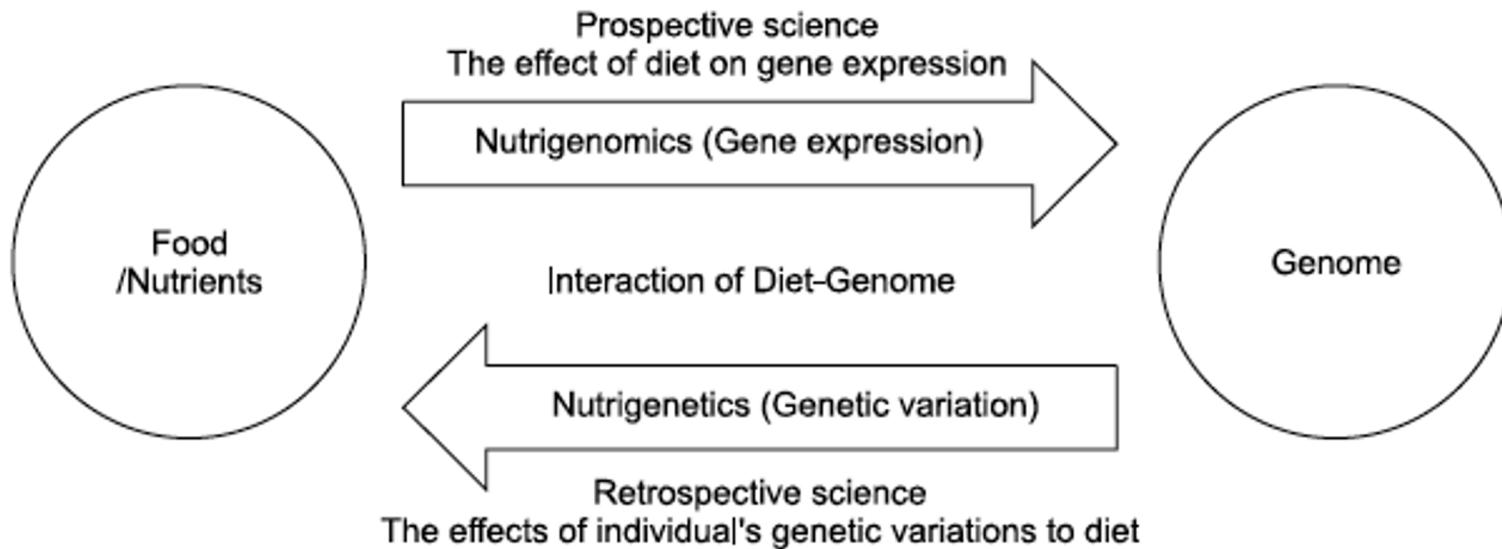
<b>Allele</b>	Any of the possible forms in which a gene for a specific trait can occur. In humans, two alleles for each gene are inherited, one from each parent. (Base: G,C;A,T)
<b>Heterozygous</b>	Paired alleles that are different (GC)
<b>Homozygous</b>	Paired alleles that are the same (GG)
<b>Genotype</b>	The genetic makeup of an individual (i.e. base pairs CC or CT) *dominant/recessive
<b>Phenotype</b>	The set of observable characteristics resulting from the interaction of genotype with the environment (i.e. eye color)
<b>Polymorphism</b>	Changes that occur in the genes that create certain traits in a population
<b>Nucleotide</b>	A compound consisting of a nucleoside linked to a phosphate group. Nucleotides form the basic structural unit of DNA

# Definitions

## 102

<b>Nutritional genomics</b>	The study of the <u>effect genes have on the risk of disease or dysfunction</u> <u>that can be reduced through nutritional intervention</u> . It also includes <u>the impact the environment has on genes</u> . This umbrella term includes nutrigenetics, nutrigenomics, and nutritional epigenomics.
<b>Nutrigenomics</b>	The study of the <u>impact of diet and lifestyle</u> (food, stress, sleep, toxin exposure) <u>on gene expression</u> . How nutrients and food compounds alter the DNA transcription/translation process, affecting the expression of genes that regulate metabolic pathways, affecting health outcomes. (how lifestyle affects genes)
<b>Nutrigenetics</b>	The study of the <u>impact that changes in the genes have on potential health outcomes</u> (strongly influenced by food, nutrition, stress, toxins). (how genes affect lifestyle)
<b>Epigenetics/epigenome</b>	The study of changes that occur by modifying gene expression (not the actual genetic code)

# Gene Diet Interaction: It's Complicated



# Genetic Testing and Your Practice



# Reminders for your clients

- Genes don't change (you're not attempting to go from CC to CT)
- Genes aren't your destiny!
- There's a lot we don't know
- Likely part of the future of personalized medicine
- These are genes you *want* to know about (not 'scary')
- Nutritional genomics tests are not diagnostic (HFE example)
- An expert translator (dietitian) is a critical part of the team

# Direct to consumer testing



The global "direct-to-consumer" genomic testing market valued at \$117 mill (2017)



Ancestry.com (7 million sold) \*2/2018



23andMe (5 million customers) \*7/2018



Data varies!



How is your data protected and stored?



DTC tests for non-medical, general wellness, or low risk medical purposes are not reviewed by the FDA

# Tips on Assessing DTC Testing

- List of SNPs?
- Who developed the science?
- Sample report?
- Age of company?
- WHAT are they testing?  
(proteins, toxins, microbiome,  
bacteria)
- Who's running their results  
(lab?) and interpreting data?
- Cost?
- Overpromising?
- Selling products (supplements,  
etc)
- Using unqualified interpreters
- Vague site?
- Hard to find details
- Privacy information?
- Easy to contact?
- Time to result

<b>May/Could</b>	This variant may indicate..... This could mean that you may be predisposed to high blood pressure, but we need to discuss some other factors first.
<b>Predispose</b>	This variant may predispose you to having high blood pressure but there are many factors.
<b>Associated</b>	This gene variant is associated with high blood pressure but let's explore.
<b>Predict</b>	It is predicted that people with this gene may be able to lose more weight with higher protein intake.
<b>You should focus on</b>	You should focus on increasing your physical activity, specifically endurance training based on the results I have here.
<b>You are less likely to be</b>	You are less likely to be lactose intolerant

# Genetic “language”

# Ginger language

- “You can ask your doctor to order a blood draw for your vitamin D levels”
- “When’s the last time you had your cholesterol checked?”
- “Do you know your family history of heart disease or diabetes?”
- “This is not diagnostic”
- “It sounds like this isn’t showing up for you in your life right now”
- “Let me make some connections for you”
- “I have a lot of questions; I need your input”



# Is Nutrigenomics the Magic Bullet, Finally?

- Many clients think that with nutrigenomic data, we can tell them exactly what to eat. I hear “now I’ll know exactly what works for MY body”

Not so fast....

- Be clear about what we can and cannot do in this field right now.
- Understand that it is changing daily.



# Setting Expectations

- *Genes are not your destiny*
- Not diagnostic
- State a potential predisposition

# Case Study 1

- JL brings you some DTC testing he had done recently. He doesn't understand his test results but fears that the *MTHFR* variant he has means he may get cancer.

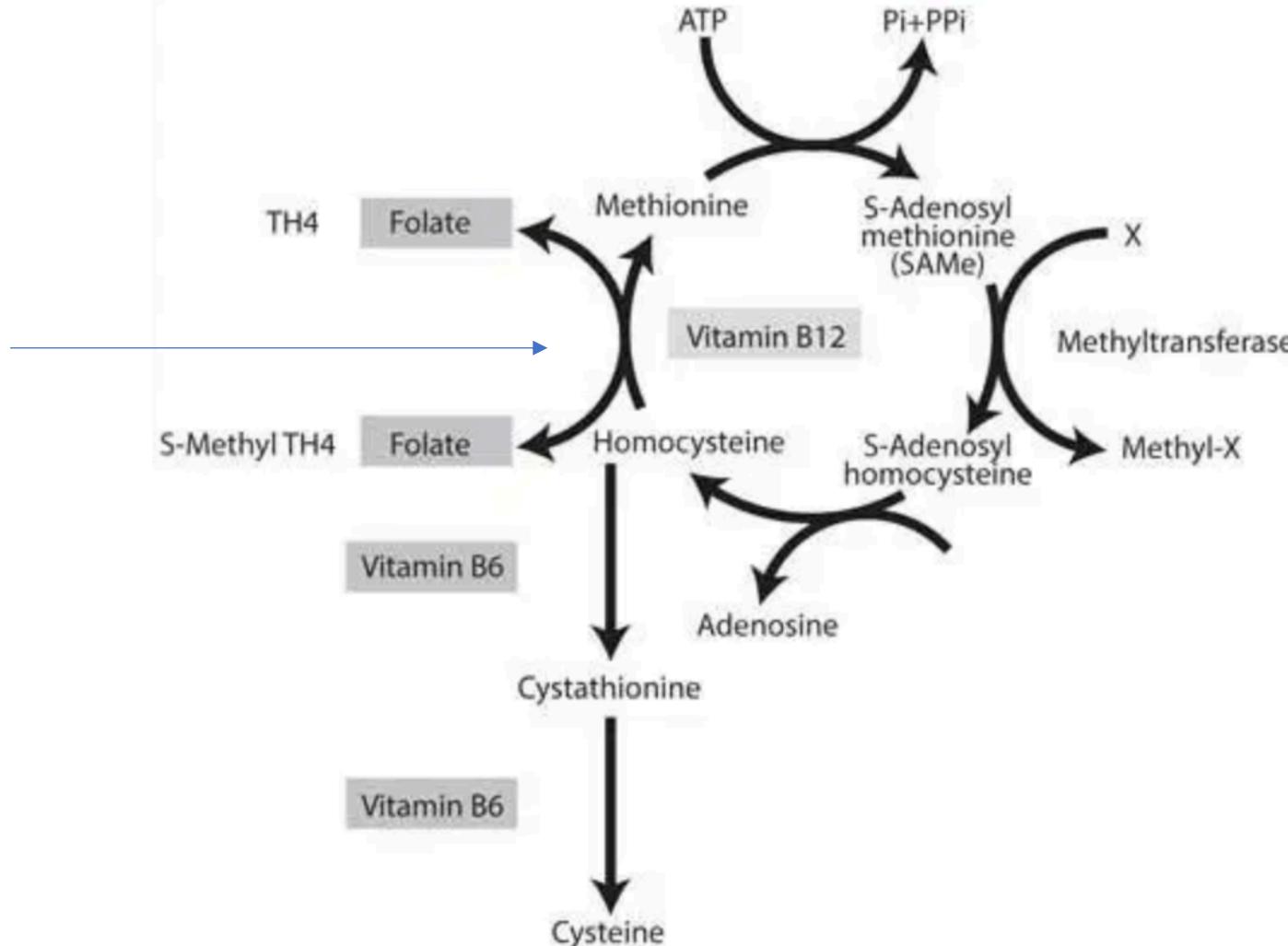
## What do you do next?

- Look up the DTC company together. Assess it for quality and safety.
- Educate on some genetic basics. Educate on what MTHFR is.
- Educate on dietary options for folate, B12 and B6
- Refer to his doctor for homocysteine blood testing
- Refer to his doctor for possible medical genetics testing

The background of the slide features a dark, abstract pattern of glowing particles. These particles are primarily small dots of various colors, including red, green, blue, and yellow, scattered across the surface. In the lower-left quadrant, there is a denser cluster of these particles, creating a more concentrated area of light. The overall effect is reminiscent of a microscopic view of a biological sample or a digital representation of data points.

Let's Talk  
Genes!

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# MTHFR

- Regulates enzymes related to methylation
- C677T (common) \*rs1801133 (GG normal, AG reduction of function by 30% max, AA reduced up to 70%)
- Slows MTHFR enzyme=reduced capacity to use folate to convert Hcy to methionine to SAM required for methylation of cytosine in DNA (controls gene expression)
- Low folate intake in carriers of C677T may be more prone to developmental defects in some populations.

# PPARG

- 107 results
- Plays a role in weight gain and inflammation
- PPAR is a protein that binds with DNA to increase gene expression. 3 types: alpha, beta and gamma
- PPARG: activated in adipose tissue
- Calorie restriction decreased PPARG gene expression. A high fat diet increases it in the fat cells of mice.
- PPARG rs1805192: significantly associated with hypertriglyceridemia



# FTO

- 76 results
- Seems to cause weight gain in a specific part of the hypothalamus.
- The following counteracts the FTO gene's ability to cause weight gain
  - eating fewer calories
  - physical activity
  - curcumin
- rs1477196 is significantly associated with obesity.
- rs1558902 is associated with a higher BMI

# Weight-related Genes

- 25-70% of variability in BMI may be attributed to genetic factors!
- Don't oversimplify: complex gene-environment interactions + hundreds of genes involved in determining weight
- One FTO gene variant may increase weight by 3kg/increase obesity risk
- Genetic variation may affect:
  - appetite
  - calorie intake
  - macronutrient preference
  - insulin signaling
  - adipogenesis
  - lipid metabolism



# Case Study 2

- JJ has a variant in the methylenetetrahydrofolate reductase (MTHFR) gene.  
Hcy levels are normal: what's going on?
- YL does not have the MTHFR gene.  
Hcy are elevated: what's going on?

A mutation in a single gene can result in a specific disorder, but chronic diseases (CVD and DM) are related to many genes (polygenic). Clients should be educated on how their genes interact with their environment and dietary and lifestyle choices.

# Incorporating Nutrigenomics Into Your Practice

How do we use it to  
counsel on a healthy diet?

- Research on genetics and behavior change
- How to apply this in a private practice / clinical setting
- Counseling patients and behavior change

# Genomic Data Can Lead to:



More exercise



Lower saturated fat intake



Balanced macros



Eating more nutrients from  
plants!



## Nutrigenomics and Behavior Change

- A 2018 review found that genetic testing facilitates positive behavior changes
- Behavior change was improved among those who received personalized recommendations based on genetic testing
- When compared to changes in physical activity and sleeping pattern, the best results are seen for dietary changes

## Nutrigenomics in Your Practice

- Every patient has different needs; individualize
- A genetic test can inform effective counseling strategies *but is only one tool in your toolbox!*
- Different dietary profiles may benefit individuals with different genetic profiles (macro distribution, for example)
- Genes *do* influence metabolism, risk for certain health factors, obesity and response to exercise, as well as behaviors related to hunger, etc ...
- BUT we must use caution in how we interpret them (not diagnostic)

# Making Nutrigenomics *Part* of Counseling

Fitness	Know what types of exercise to recommend (FTO, LIPC, LPL, PPARG and others)
Behavior	Know what behaviors your clients are predisposed to - a great way to open up dialogue around various behaviors
Food	Help plan meals in accordance with needs and likes as well as genetic profile and behavioral predispositions (i.e. snacks, etc)

# Takeaways for Counseling with Genetics

- Genes determine what diet is best for your patients; but it's complicated.
- There is no one-fits-all diet
- Genes influence more than just diet: they determine behavior, eating habits, response to exercise, metabolism, and more
- Each patient is unique
- Stay flexible in your practice and base decisions on the latest science. Expect ongoing continuing ed and training.

# Limitations and Legal Considerations

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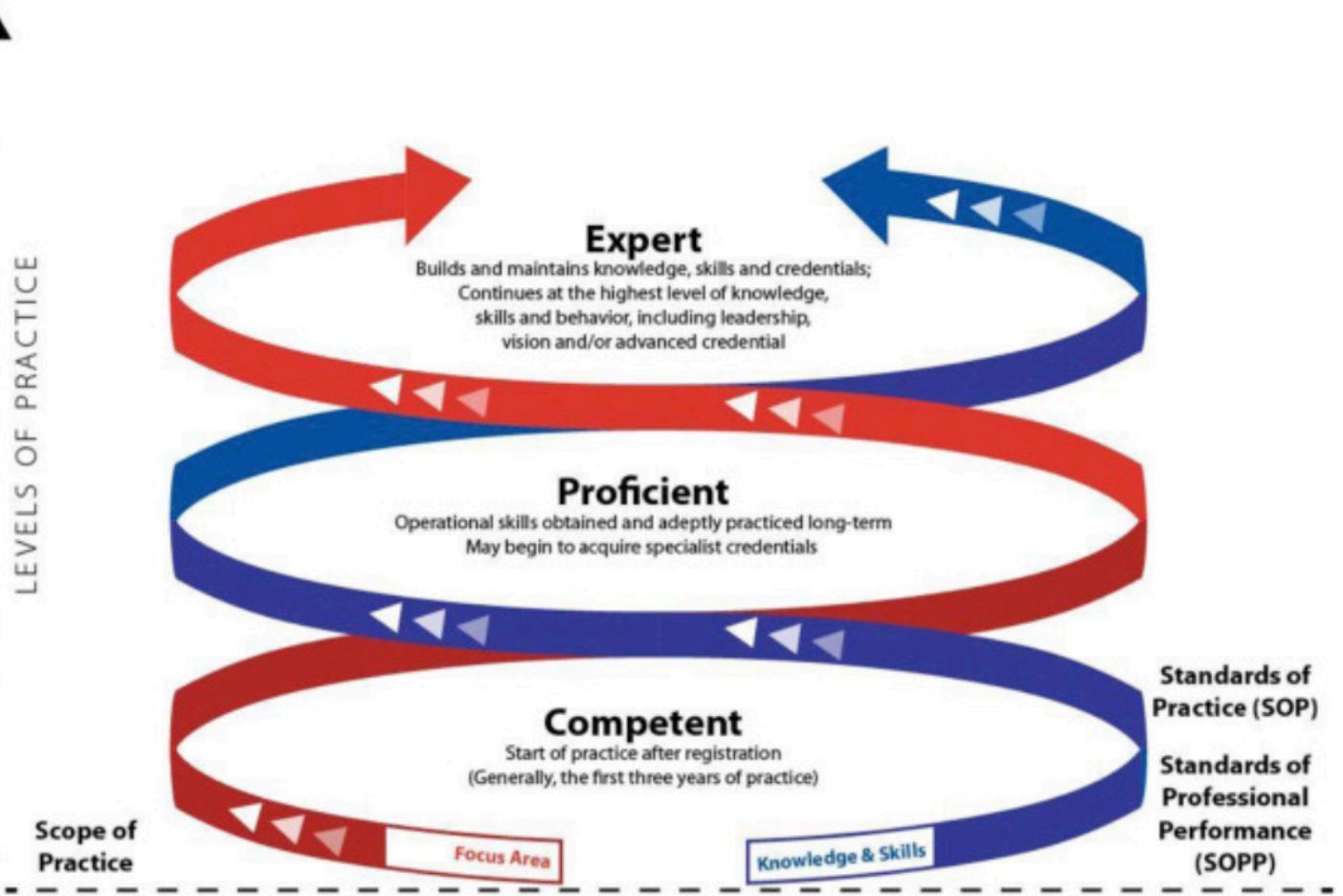


# Scope of Practice

- International Society of Nutrigenetics/Nutrigenomics (ISNN) regulates the field
- RDNs must obtain basic competency in genetics before entering the field of nutrigenomics
- To personalize MNT and analyze disease risk, RDNs must use reliable testing methods and consider factors that affect genetic mutations.

Noland D, Raj S. Academy of Nutrition and Dietetics: Revised 2019 Standards of Practice and Standards of Professional Performance for Registered Dietitian Nutritionists (Competent, Proficient, and Expert) in Nutrition in Integrative and Functional Medicine. JAND. 2019;119(6):1019-36.

### Life-long Learning and Professional Development...



Adapted from the *Dietetics Career Development Guide*. For more information, please visit [www.eatrightPRO.org/futurepractice](http://www.eatrightPRO.org/futurepractice)

# Scope of Practice

Unethical for RDNs to counsel on genetics that are medical in nature  
(eg. BRCA1 and BRCA2)

Medical geneticists interpret risk and discuss treatment options or surgery based on an individual's needs

Educating patients who “don’t want to know” about disease risk (do they have all the information they need for nutrigenomics?)

# Keep Yourself Safe

- Don't counsel on genetics alone
- Talk to the company; get to know them
- Discuss who orders and reviews the data (often an MD)
- Ask about their testing facility and lab
- *Ask specifically about regulations in your state*

# Bottom line on regulation

- It changes over time
- You are responsible for following your own state regulation to keep you and your clients in compliance
- Make sure you're working with a DTC company with a good reputation and can openly talk to you about regulation

# Putting it into Practice

- Find a reliable testing company (CAP and CLIA certified)
- Do research to better understand the role of genes in nutrition and behavior - read up on articles and new findings
- Keep up with the most recent research - constantly evolving!
- Use nutrigenomics as an additional tool in your toolbox
- Be clear about what you can and cannot provide; set expectations.
- Refer out when needed

# Vegetarian Nutrition

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*Experts in Plant-Based Nutrition*

# Join VN DPG!

As the leading authority on evidence-based plant-based nutrition, VN DPG's vision is to optimize global health and well-being by:

## Creating and disseminating

Creating and disseminating plant-based nutrition education materials

## Supporting

Supporting cutting edge research

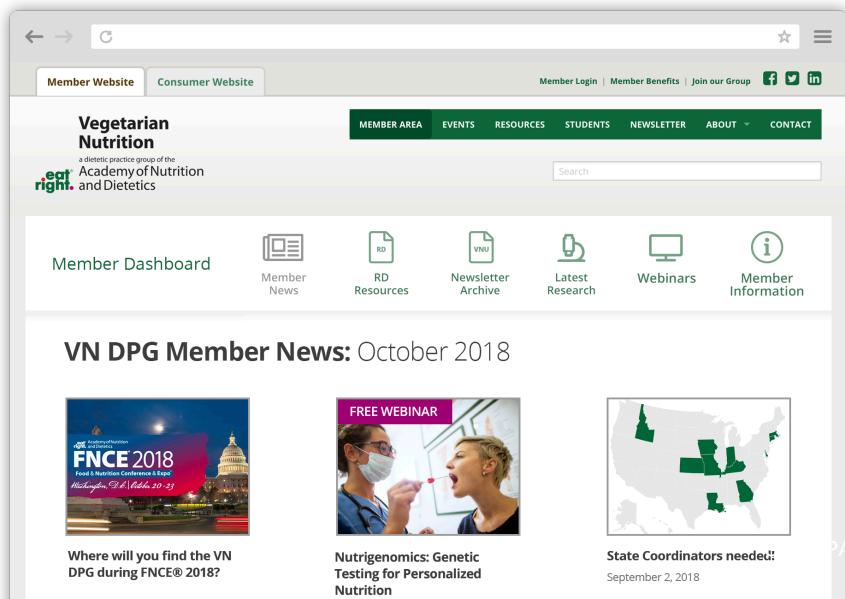
## Advocating

Advocating for influential public policy



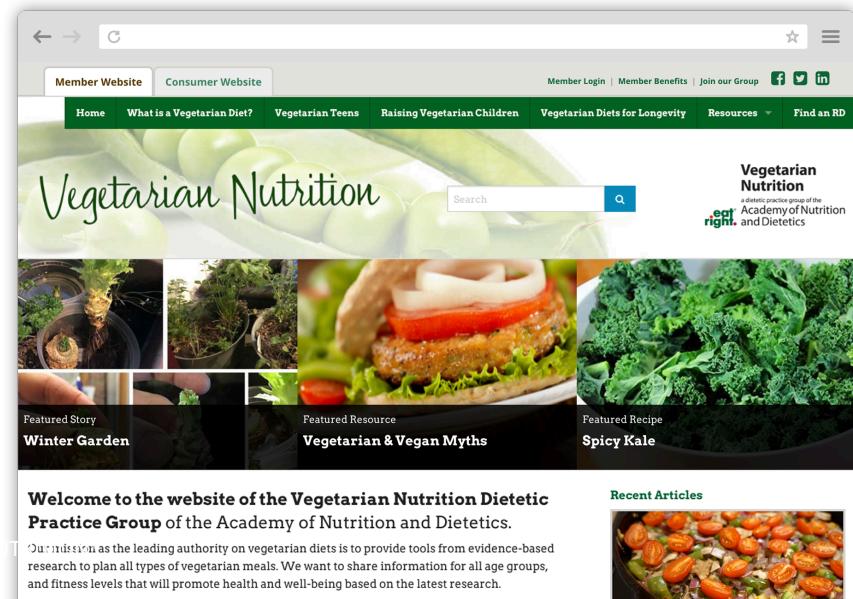
# Vegetarian Nutrition

Member Website:  
**VNDPG.org**



The screenshot shows the homepage of the Member Website (VNDPG.org). At the top, there are tabs for "Member Website" and "Consumer Website". Below the header, the "Vegetarian Nutrition" logo is displayed, followed by a subtext: "a dietary practice group of the Academy of Nutrition and Dietetics". A "Member Dashboard" section contains links for "Member News", "RD Resources", "Newsletter Archive", "Latest Research", "Webinars", and "Member Information". A "VN DPG Member News: October 2018" section features a "FREE WEBINAR" thumbnail and a "State Coordinators needed!" map of the United States. Other news items include "FNCE 2018" and "Nutrigenomics: Genetic Testing for Personalized Nutrition".

Consumer Website:  
**VegetarianNutrition.net**



The screenshot shows the homepage of the Consumer Website (VegetarianNutrition.net). The header includes tabs for "Member Website" and "Consumer Website". The main navigation bar features links for "Home", "What is a Vegetarian Diet?", "Vegetarian Teens", "Raising Vegetarian Children", "Vegetarian Diets for Longevity", "Resources", and "Find an RD". The main content area has a large "Vegetarian Nutrition" title over a background image of green vegetables. It includes sections for "Featured Story: Winter Garden", "Featured Resource: Vegetarian & Vegan Myths", and "Featured Recipe: Spicy Kale". A "Recent Articles" section is also visible.

# VN DPG Member Benefits

## Vegetarian Nutrition Update Newsletter

- Vegetarian Nutrition Update is a quarterly newsletter published by VN DPG and distributed free to all VN members

## State Coordinators Program

- Promote VN DPG by exhibiting at affiliate meetings and community events
- Coordinate networking events for VN DPG members
- Connect with Academy student members

## Webinars

- Continuing education on plant-based nutrition-related topics

## Research Grant

- VN DPG offers a \$10,000 research grant for innovative vegetarian research to RDNs, NDTRs and dietetics students who are members of the Academy.

### Join our social media



Facebook @vegetariannutrition



Twitter @vndpg



Instagram @vndpg



LinkedIn Member Group:  
[linkedin.com/groups/8315844](https://linkedin.com/groups/8315844)

### Student social media forums



Facebook @studentvndpg

# Thanks for having me!



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Champagne  
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# Additional References and Resources

- <https://www.ncbi.nlm.nih.gov/pubmed/29635250>
- <https://foodandnutrition.org/from-the-magazine/nutrigenomics-future-or-fad/>
- [https://www.researchgate.net/publication/274901027\\_Obesity\\_Interactions\\_of\\_Genome\\_and\\_Nutrients\\_Intake](https://www.researchgate.net/publication/274901027_Obesity_Interactions_of_Genome_and_Nutrients_Intake)
- <https://www.precisionnutrition.com/genetic-testing-ebook>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4572087/>
- <https://www.businessinsider.com/personalized-nutrition-dietary-advice-dna-test-microbiome-2017-6>
- <https://ghr.nlm.nih.gov/>
- <https://www.nutrigenomics.arizona.edu>
- <http://www.todaysdietitian.com/newarchives/090112p48.shtml>