

## Grown, Green and Healthy: A Palette of Plant-based Diets

Ellen Karlin, MMSc, RDN, LDN, FADA

 @karlinldn

NMPPhA 2023 Virtual Mid-Winter Meeting



This work is the intellectual property of the presenter and cannot be copied, reproduced or distributed without the written permission of the presenter.

1

## Objectives

- Discuss plant-based dietary patterns and plant-forward cooking and eating styles
- Discuss the synergy between whole food, plant-based nutrition and integrity of microbiome
- Discuss the research supporting benefits of plant-based dietary patterns for optimal health



2

## Organizations Support Plant-based Eating

- American Cancer Society
- American Heart Association
- World Health Organization
- British Dietetic Association
- Dietitians of Canada
- The Physicians Committee for Responsible Medicine
- American Diabetes Association
- American College of Endocrinology
- American Association of Clinical Endocrinologists
- American Medical Association
- American Academy of Nutrition and Dietetics

3

## Pharmacists Can Encourage Plant-based Diets

- According to a post in the St. John 's University College of Pharmacy and Health Sciences
- “Adopting a plant-based diet is a preventative measure pharmacists can also suggest, as it not only prevents the progression of chronic diseases, but it can also reverse them.”
- “Pharmacists are the most accessible health care professionals and as such should understand the scientific benefits of a plant-based diet and how a plant-based diet can be implemented in their communities.”

<https://healthcarepharmacist.com/combating-chronic-disease-with-a-plant-based-diet/>

4

“Plant-forward eating is the most significant mega-trend underway in America.”

- Pescatarian
- Flexitarian
- Semi-vegetarian

5

### Plant-Forward Defined

A style of cooking and eating that emphasizes and celebrates, but is not limited to, plant-based foods—including fruits and vegetables (produce); whole grains; beans, other legumes (pulses) and soy foods; nuts and seeds; plant oils; and herbs and spices—and that reflects evidence-based principles of health and sustainability.

Source: Menu of Change, a joint initiative of the CIA and Harvard T.H. Chan School of Public Health—Department of Nutrition.

Plant-Forward Eating is a “Mega-Trend”

- “It is the position of the Academy of Nutrition and Dietetics that appropriately planned vegetarian, including vegan diets are healthful, nutritionally adequate, and may provide health benefits for the prevention and treatment of certain diseases. These diets are appropriate for all stages of the life cycle, including pregnancy, lactation, infancy, childhood, adolescence, older adulthood, and for athletes.”



Menu of Change, a joint initiative of the CIA and Harvard T.H. Chan School of Public Health—Department of Nutrition. Melissa K. Craig, M.S., L.D., R.D., Position of the Academy of Nutrition and Dietetics: Vegetarian Diets. *Acad Nutr Diet*. 2016;18(12):1070-1082.

6

2020-2025 Dietary Guidelines for Americans



[https://www.dietaryguidelines.gov/sites/default/files/202012/Dietary\\_Guidelines\\_for\\_Americans\\_2020-2025.pdf](https://www.dietaryguidelines.gov/sites/default/files/202012/Dietary_Guidelines_for_Americans_2020-2025.pdf)

7



Dietary Patterns

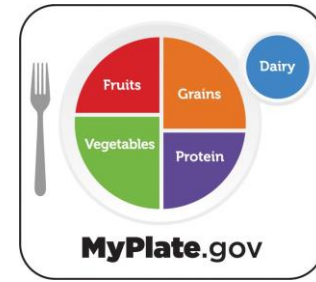
- Healthy U.S.-Style
- Healthy Vegetarian
- Healthy Mediterranean-Style

**It's about the pattern of eating**, not just healthy choices here and there. The *Dietary Guidelines* focuses on the combination of foods and beverages that make up an individual's whole diet over time, and not single foods or eating occasions in isolation. Research shows that the ongoing pattern of an individual's eating habits has the greatest impact on their health.

[https://www.dietaryguidelines.gov/sites/default/files/202012/Dietary\\_Guidelines\\_for\\_Americans\\_2020-2025.pdf](https://www.dietaryguidelines.gov/sites/default/files/202012/Dietary_Guidelines_for_Americans_2020-2025.pdf)

8

Healthy U.S.-Style Dietary Pattern



[https://www.dietaryguidelines.gov/sites/default/files/202012/Dietary\\_Guidelines\\_for\\_Americans\\_2020-2025.pdf](https://www.dietaryguidelines.gov/sites/default/files/202012/Dietary_Guidelines_for_Americans_2020-2025.pdf)

9

Fruit and Vegetable Intake in America

- Recommendation: 2C/day fruits and 2.5C/day vegetables
- 80% are not meeting fruit recommendation
- 90% are not meeting vegetable recommendation



[https://www.dietaryguidelines.gov/sites/default/files/2021-03/Dietary\\_Guidelines\\_for\\_Americans\\_2020-2025.pdf](https://www.dietaryguidelines.gov/sites/default/files/2021-03/Dietary_Guidelines_for_Americans_2020-2025.pdf)

10

“Swap” in More Whole Grains

Swap out	Swap in
White bread White-flour tortillas Processed breakfast cereal	Whole grain bread Whole wheat tortillas, pita Oatmeal
White rice Pasta	Brown rice, quinoa Buckwheat, bulgur, millet as a side dish
Chips Pretzels	Popcorn, whole grain or rye crackers as a snack

<https://www.eatright.org/food/nutrition/dietary-guidelines-and-myplate/how-to-add-whole-grains-to-your-diet>

11

First Poll Question

- Which of the following are nutrients of concern in the vegetarian diet?
  - A. Vitamin B12 and iron
  - B. Antioxidants
  - C. Phytochemicals
  - D. Dietary fibers
- Please answer on Instagram @karlinldn

12

### Vegetarian Diet

- Lacto-ovo-vegetarian
  - Eggs, dairy and plants
- Ovo-vegetarian
  - Eggs and plants
- Lacto-vegetarian
  - Dairy and plants
- Pescatarian
  - Fish, eggs, dairy and plants
- Vegan
  - Avoids all animal products
- Raw vegan
  - Only uncooked plants



13

### Veganism and Future Pharmacists

- Study to assess pharmacy students' knowledge on plant-based nutrition
- Results: 37% were confident discussing plant-based nutrition
- “Pharmacists, as experts in medicines, should be confident discussing medicine-related issues that may arise from people adopting veganism, including checking about animal-derived pharmaceutical product excipients, formulation processes, and determining whether suitable alternatives exist.”
- “Ethically, pharmacists should strive to ensure that medicines are selected and used appropriately while also respecting patient autonomy and personal beliefs.”

Harris, L. A., Corbridge, F., Hall, M., Craig, R., & Harris, A. (2023). Vegetarian. Are future pharmacists ready to graduate ahead? *Currents in pharmacy teaching & learning*, 2(20), 922-928.

14

## Healthy Plant-Based Eating Limits Added Sugars

15

### Easy “Swaps” to Limit Added Sugars

Instead of	Try
Soda	Fluoridated water, unsweetened tea and coffee, plain milk
Veggie chips	Veggies
Ultra-processed food	Fresh and minimally processed foods
Calorie-dense	Nutrient-dense
Fruit punch	100% fruit juice
Sugar-sweetened beverages	Spa water

<https://www.mouthhealthy.org/en/az-topics/diet-and-dental-health>

16

### Intrinsic Natural Sugars

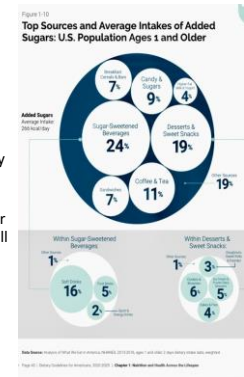


17

### Added Sugars in Diet

- Brown sugar, table sugar, corn syrup, beet sugar, date sugar, coconut sugar, turbinado sugar, agave nectar, maple syrup, honey molasses...
- “Limiting the amount of sugar your entire family eats is good for your teeth and key to your overall health.” ADA  
<https://www.mouthhealthy.org/en/nutrition/child-snacking-tips>

18



Sugar-Sweetened Beverages: Oral & Systemic Disease

- Systematic review and meta-analysis of 88 cross-sectional studies
  - General population (children, adolescents and adults)
  - Positive association (first study to show a dose-response gradient) between SSB consumption and caries
  - Consuming SSB daily or several times/week increases dental caries and erosion risk
- Large prospective cohort study
  - 934,777 participants, part of the Cancer Prevention Study
  - Drinking 2+ servings SSB daily increases colorectal and kidney cancer risk



Valencueta MI, Watsonhouse B, Aggarwal VR, Bloor K, Doran T. Eur J Public Health. 2021;31(1):122-129. McCullough MI et al. AACR Journal 2022

19

“Other Sources” of Added Sugars

- Breakfast cereals
- Granola bars
- Yogurt
- Applesauce
- Peanut butter
- Crackers
- Breads
- Salad dressing
- Sauces
- Ketchup



20

Old Nutrition Facts Label

New Nutrition Facts Label



21

Condiments With No Added Sugar



22

Healthy Plant-based Snack “Swaps”

Swap Out	Swap In
Pudding	Low-sugar yogurt with fresh fruit topping or coconut yogurt
Cheese flavored crackers	String cheese or plant-based cheese
Veggie chips	Celery with nut or seed butter
Potato chips	Baby carrots or jicama with hummus
Chicken nuggets	Tofu cubes Avocado slices
Candy bar	Nuts, seeds and 70% dark chocolate chips
Caramel apple	Sliced apple drizzled with melted 70% dark chocolate

23

Food Synergy

24

## Food Synergy

- “In recent years researchers, public health experts and RDs have acknowledged that nutrients and foods are not consumed in isolation. Rather, people consume them in various combinations over time—a dietary pattern—and these foods and beverages act synergistically to affect health.”



[https://www.dietaryguidelines.gov/sites/default/files/2020/12/Dietary\\_Guidelines\\_for\\_Americans\\_2000-2025.pdf](https://www.dietaryguidelines.gov/sites/default/files/2020/12/Dietary_Guidelines_for_Americans_2000-2025.pdf)

25

## Poll Question

- What are phytonutrients?
  - A. Essential nutrients that include protein, carbohydrates and fat
  - B. Essential nutrients that include vitamins and minerals
  - C. Health promoting components found in plant foods
  - D. Components found in ultra-processed food

26

## “Eat the Rainbow”- Phytonutrients

- Compounds that contribute to smell, taste and color
- Work synergistically for more health benefit
  - Antibacterial and antioxidant activity
- The more colors you eat, more components that support health
  - Spinach-lutein
  - Tomato and watermelon-lycopene
  - Green grapes-flavanols
  - Red grapes-resveratrol



27

## Vitamin C-Rich Foods Support Health

- Foods rich in vitamin C include health promoting phytochemicals
  - Watermelon (lycopene and B carotene)
  - Orange (carotenoids-lutein and zeaxanthin)
  - Grapefruit (carotenoid-lycopene)
  - Lemon (flavone-hesperidin)
  - Strawberry (flavonol-quercetin)
  - Kiwi (carotenoids-lutein, zeaxanthin and B carotene)
  - Broccoli (flavonoids, glucosinolates, tocopherols, carotenoids)
  - Cauliflower (glucosinolates)



28

## Microbiome

29

## Gut Microbiome

- Contains > 1,000 microbial species
  - 2 phyla: Bacteroidetes and Firmicutes
  - Genera: Bacteroides, Prevotella, Bifidobacterium, Eubacterium, Clostridium, Streptococcus, Enterobacteriaceae
- Composition is impacted by diet
  - Plant-based diets promote diverse gut microbiome
  - Vegetarians and vegans have greater alpha diversity
  - SCFAs (acetate, propionate, butyrate) – microbial metabolites of fiber; help maintain colonic epithelium
  - Acetate, propionate, butyrate protect against disease
    - Type 2 diabetes
    - Inflammatory bowel disease
    - Immune disease

Tomova A, Bakovsky I, Rembert E, et al. The Effects of Vegetarian and Vegan Diets on Gut Microbiota. *Front Nutr*. 2019;6:47. Published 2019 Apr 17.

30

## Last Poll Question

- Good source/s of prebiotics include:
  - A. Kimchi
  - B. All fermented foods
  - C. Bananas
  - D. Yogurt

31

## Prebiotics

- “A substrate that is selectively utilized by host microorganisms conferring a health benefit”  
International Scientific Association for Probiotics and Prebiotics (ISAPP)
- Fiber naturally present in plants (inulin, pectin, resistant starch, beta-glucan)
- Food source for friendly probiotic bacteria
  - Ferment fiber
  - Support healthy gut barrier function
  - Keeps lining of small intestine healthy



<https://isappscience.org/for-consumers/learn/prebiotics/>  
Candiani M. Gut 2018;8(8):1516-1526.

32

## Which Apple Cultivar is your Favorite?

- Apples are high in fiber
- Pectin accounts for 50% of apple's fiber content
- Pectin has prebiotic benefits



33

## Intrinsic Dietary Sources of Prebiotics

- Apples
- Bananas
- Asparagus
- Jerusalem artichoke
- Onions
- Tomato
- Garlic
- Citrus fruits
- Berries
- Whole grains (whole oats, barley, wheat, rye)
- Leeks
- Black beans, kidney beans, chickpeas, soybeans

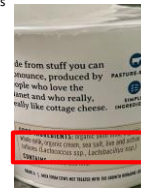


Davani-Davari D, Negahdaripour M, Karimzadeh L, et al. *Food*. 2019;8(3):92. Published 2019 Mar 9.

34

## Dietary Sources of Probiotics

- “Live microorganisms that are intended to have health benefits...”
- Fermented foods and beverages
  - Aged cheese, crème fraiche, kefir
  - Yogurt and cottage cheese with live-active cultures
  - Miso, natto, tempeh
  - Sauerkraut, kimchi
  - Kombucha
  - Wine
  - Functional beverages



<https://www.ncjih.gov/health/prebiotics-what-you-need-to-know>

35

## Homeostasis

- Symbiotic relationship between microbiome and host
- Role of prebiotic and probiotic-rich foods to modulate the ecosystem is area of emerging research
- Long-term studies needed
- “knowledge suggests that a plant-based diet may be an effective way to promote a diverse ecosystem of beneficial microbes that support overall health.”
- “Further research is required to fully characterize the interactions between diet, microbiome and health outcomes.”

Tomova A, Bukovsky I, Rembert E, et al. The Effects of Vegetarian and Vegan Diets on Gut Microbiota. *Front Nutr*. 2019;6:47. Published 2019 Apr 17.

36

## Evidence-based Research

37

### Healthy Plant-Based Diet

- Linked with decreased risk for
  - CVD
  - CRC in men
  - Type 2 diabetes
  - Obesity
- Associated with beneficial metabolic effects
  - Decrease in blood pressure, C-reactive protein, fasting plasma glucose levels
- Polyphenols found in plants have antioxidant properties



Tangney CC, Rehmussen HE. Polyphenols, inflammation, and cardiovascular disease. *Curr Atheroscler Rep*. 2015;15(5):234. doi:10.1007/s12388-013-0234-x

38

### Plant-based Diets and CVD

- General population cohort study evaluating plant-based diets; *Journal of the American Heart Association*
- Reviewed data from community-based cohort of 12,168 middle-aged adults in Atherosclerosis Risk in Communities Study
- Median follow-up of 25 years
- Results: healthy plant-based diet group (whole grains, fruits, vegetables, nuts, legumes, tea, coffee) had 19% lower risk of cardiovascular disease
- Clinical implication: Healthy plant-based diet is associated with lower risk of cardiovascular risk factors (obesity)



Kim H. *J Am Heart Assoc*. 2019;8(16):e012865.

39

### Plant-based Diet and Colorectal Cancer Risk

- Population-based prospective cohort study
- N = 79,952 men and 93,475 women from Multiethnic Cohort Study
- Healthy plant foods
  - Whole grains, fruits, veggies, oils, nuts, legumes, tea, coffee
- Less healthy plant foods
  - Refined grains, sweets, processed potatoes and fruit juices
- Results: "Greater adherence to plant-based diets rich in healthy plant foods and low in less healthy plant foods is associated with a reduced risk of CRC in men."

Kim J, Beachley CJ, Williams LR, et al. Plant-based dietary patterns defined by a priori methods and colorectal cancer risk by sex and race/ethnicity: The Multiethnic Cohort Study. *BMC Med*. 2020;18(1):202.

40

### Healthy Plant-based Diets and T2D

- Researchers examined results of 3 prospective studies looking at the association between a healthy plant-based diet and T2D
- N = 69,949 women from the Nurses' Health Study, 90,239 women from the Nurses' Health Study 2 and 40,539 men from the Health Professionals Follow-Up Study
- Results: healthy plant-based diets were associated with substantially lower risks of developing T2D



Sung A, Shapoorian M, Stern EA, et al. Plant-based Dietary Patterns and Incidence of Type 2 Diabetes in US Men and Women: Results From Three Prospective Cohort Studies. *PLoS Med*. 2016;13(5):e1001919. Published 2016 Jun 14. doi:10.1371/journal.pmed.1001919

41

### Vegetarian Diets and Weight Reduction

- Meta-analysis of 12 randomized controlled trials
- N = 1,151 people
- Studies compared weight loss among vegan and lacto-ovo-vegetarians versus low fat and low carbohydrate diets
- Results: Vegans and vegetarians lost 2-6# more than non-vegetarians over 18 weeks
- Conclusion: Vegetarians and vegans had significant weight reduction compared to non-vegetarians; vegan diets resulted in greatest weight loss



Huang BY. *J Gen Intern Med*. 2016;31(1):109-116.

42

### Mediterranean Dietary Pattern

- 2 year dietary intervention study
- N= 322 moderately obese individuals
- Results: weight loss and beneficial metabolic effects following Mediterranean diet



<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3208661/>

43

### Whole Food, Plant-based Nutrition

Encourage	Discourage
Nutrient-dense, whole plant foods and beverages	Foods with added salt and saturated fat
Fruits and vegetables (fresh, canned, frozen, dried)	Added sugars
Fermented foods	Ultra-processed foods
High-fiber grains	Refined carbohydrates

44

### Balance Promotes Health

- Mindfulness
- Sense of humor
- Sleep
- Reduce stress
- Exercise
- Healthy plant-based dietary pattern
- Take prescribed meds



45

### Call to Action – Role of Pharmacists

- Encourage whole, plant-based, nutrient-dense foods
- Integrate nutrition education into oral healthcare messages
- Referral to registered dietitian to optimize diet
- Provide support and recommend patient-friendly sources of information
  - <https://www.mouthhealthy.org/en/nutrition/>
  - <https://www.myplate.gov>
  - <https://www.eatright.org/health/wellness/your-overall-health/>
  - <https://www.aapd.org/resources/parent/>
  - <https://www.cdc.gov/>
  - @karlinIdn

46

Thank you New Mexico Pharmacists Association

The slide features a teal background. On the right side, there is a large, light blue 3D question mark. On the left side, there is a small square portrait of a woman with dark hair. Below the portrait, the text 'karlinellen@gmail.com' is written in blue, followed by '@karlinIdn' with an Instagram icon. At the bottom right, there is a small disclaimer: 'This work is the intellectual property of the presenter and cannot be copied, reproduced or distributed without the written permission of the presenter.'

47