The use of plant-based diets for the treatment of Polycystic Ovary Syndrome

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Overview

• Defining variations in plant-based diets
• Research examining plant-based diets in the treatment of PCOS and other obesity-related conditions
• Other benefits of plant-based diets beyond weight loss and PCOS treatment
• Working with your patients and clients
Achieving healthy weight through reduction of energy intake

Improve dietary self-monitoring
Achieving healthy weight through reduction of energy intake

- Improve dietary self-monitoring
- Using plant-based diets which don’t require self-monitoring for weight loss and can improve diet quality
Diet Terms

- **Omnivorous**: No limits on food groups.
- **Semi-vegetarian**: Includes all foods but red meat and poultry is limited.
Diet Terms

- **Omnivorous**: No limits on food groups.
- **Semi-vegetarian**: Includes all foods but red meat and poultry is limited.
- **Pesco-vegetarian**: Excludes all meat and poultry. Can include fish, eggs, and dairy products.
- **Vegetarian diet**: Excludes all meat, fish, and poultry. Can include eggs and dairy products.
- **Vegan diet**: Based on grains, beans, fruits, and vegetables. Excludes all animal products (excludes meat, poultry, fish, eggs, and dairy).
In a cross-over trial of 33 women with dysmenorrhea, participants had a significantly higher serum sex-hormone binding globulin (SHBG) concentration while following a vegan diet than a standard diet.

This is important as it relates to PCOS since women with PCOS have low concentrations of SHBG, which in turn leads to higher levels of testosterone and infertility.
Does transitioning to a plant-based diet produce more weight loss than a standard low-fat diet?
Plant-based dietary intervention on body weight: Methods

- 64 overweight (BMI 26-44 kg/m²), postmenopausal women
- Randomly assigned to a low-fat vegan or control diet
- Exercise levels held constant
- 14-week study
- Weekly meetings included:
  - cooking demonstrations
  - meal planning techniques
  - tips for eating out
  - nutrition information
Diets

- **Low-Fat, Vegan Diet**
  - ~10% fat, 15% protein, 75% carbohydrates

- **Control Diet (NCEP Step II)**
  - Meat ≤6 oz/d
  - Fat ≤60 g/d
  - <30% fat, ~15% protein, >55% from carbohydrates
Results: Weight changes at 14 weeks

- **Vegan Diet (N=29)**
  - Weight change: $-5.8 \pm 3.2 \text{ kg}$
  - $P<0.05$

- **Step II Diet (N=30)**
  - Weight change: $-3.8 \pm 2.8 \text{ kg}$

(13 lbs)
Does adoption of a plant-based diet assist with weight loss maintenance?

• Objective: To assess the effect of a low-fat, vegan diet compared with the Step II diet on weight loss maintenance at 1 and 2 years.
Results: Median weight loss at 1 and 2 years

<table>
<thead>
<tr>
<th></th>
<th>1 year</th>
<th>2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegan (n=31)</td>
<td>-4.9 (0.5, 8.0) kg (11 lbs)</td>
<td>-0.8 (3.1, 4.2) kg (2 lbs)</td>
</tr>
<tr>
<td>Step II (n=31)</td>
<td>-1.8 (0.8, 4.3) kg (4 lbs)</td>
<td>-3.1 (0.0, 6.0) kg (7 lbs)</td>
</tr>
</tbody>
</table>

P=0.02 for 1 year
P=0.02 for 2 years

Is a plant-based diet effective as a dietary intervention for type 2 diabetes?

• Improvements in:
  – weight
  – insulin resistance
  – glucose tolerance
Plant-Based Dietary Intervention in Type 2 Diabetes

- NIDDK
- Randomized clinical trial
  - Vegan, low-fat, low-GI diet (n = 49)
  - Diet based on ADA guidelines (n = 50)
- 22-week study with 1-year follow-up
- Primary outcome: A1c
- Secondary outcomes: weight, lipids, urinary albumin, dietary intake
- Adult (18 years and older) participants with type 2 DM and a HgbA1c of 6.5-10.5%
Weight loss at 22 weeks
(n=49 vegan, 50 ADA)

-5.8 ± 4.4 kg
(13 lbs)

-4.3 ± 4.4 kg
(9.5 lbs)

Vegan (n=49)
ADA (n=50)

P=0.08

Weight loss at 22 weeks among participants whose diabetes medications remained unchanged.

-6.5 ± 4.3 kg (14 lbs) for Vegan (n=24)

-3.1 ± 3.4 kg (7 lbs) for ADA (n=33)

P<0.001

74-week changes in glycemia and plasma outcomes before medication change

<table>
<thead>
<tr>
<th>Glycemia and Plasma lipids</th>
<th>Vegan Diet (n=49)</th>
<th>ADA Diet (n=50)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HgA1C (%)</td>
<td>-0.40 ±0.14</td>
<td>+0.01±0.13</td>
<td>0.03</td>
</tr>
<tr>
<td>Fasting plasma glucose (mg/dL)</td>
<td>-14.1±5.8</td>
<td>-6.5±6.7</td>
<td>0.40</td>
</tr>
<tr>
<td>Total cholesterol (mg/dL)</td>
<td>-20.4±3.3</td>
<td>-6.8±4.3</td>
<td>0.01</td>
</tr>
<tr>
<td>LDL cholesterol (mg/dL)</td>
<td>-13.5±2.6</td>
<td>-3.4±3.9</td>
<td>0.03</td>
</tr>
</tbody>
</table>
WHAT IS PCOS?

Polycystic Ovary Syndrome (PCOS) is a complex hormonal, metabolic and reproductive disorder that affects women. It is a leading cause of female infertility. PCOS can lead to other serious conditions including severe anxiety and depression, obesity, endometrial cancer, type 2 diabetes and cardiovascular disease.

PCOS AFFECTS 1-IN-10 WOMEN

- **10%** Women of childbearing age estimated to have Polycystic Ovary Syndrome
- **50%** Women with PCOS going undiagnosed
- **50%** Women with PCOS who will develop type 2 diabetes or prediabetes by the age of 40
- **4.3 BILLION** Estimated annual cost to the American healthcare system to diagnose and treat women with PCOS
- **3X** The increased risk of women with PCOS developing endometrial cancer

COMMON SIGNS AND SYMPTOMS

- irregular periods
- excess facial and body hair
- severe acne
- small cysts in ovaries
- insulin resistance
- anxiety and depression
- infertility
- weight gain
- male pattern hair loss

For more information, visit PCOSChallenge.org

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What is Polycystic Ovary Syndrome (PCOS)?

• PCOS is associated with:
  – obesity
  – irregular menstrual cycles or complete anovulation
  – elevated testosterone levels
  – infertility

• PCOS is one of the most commonly seen endocrinopathy among women of reproductive age.
PCOS Quiz

• How many women of child-bearing age in the U.S. have PCOS?
  A. Between 1 in 5 and 1 in 10
  B. Between 1 in 10 and 1 in 20
  C. Between 1 in 20 and 1 in 30
  D. It’s not known
How many women have PCOS?

• Between 1 in 10 and 1 in 20 women of childbearing age has PCOS.

• As many as 5 million women in the United States may be affected.
What causes PCOS?

• Often associated with obesity.
• A main underlying problem with PCOS is a hormonal imbalance.
  – Ovaries make more androgens than normal
  – Insulin resistance
PCOS symptoms

- Infertility (most common cause of female infertility)
- Infrequent, absent, and/or irregular menstrual periods
- Cysts on the ovaries
- Acne, oily skin, or dandruff
- Weight gain or obesity, particularly around waist
- Pelvic pain
- Male-pattern baldness or thinning hair
- Dark patches of skin
- Skin tags
- Anxiety or depression
- Sleep apnea

womenshealth.gov
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womenshealth.gov
PCOS: Other health-related causes for concern

- Women with PCOS are at higher risk of developing several chronic diseases, including:
  - Diabetes
  - Hypertension
  - Some forms of cancer
  - Cardiovascular disease
  - Metabolic Syndrome
PCOS: Treatment

• Dietary changes are considered the first line of treatment for those with PCOS.

• Little is known about effective dietary treatments for the management of PCOS.
  – It is not known about how often clinicians recommend dietary changes for women with PCOS
  – Currently no standard dietary approach recommended as optimal for women with PCOS
Low glycemic index vegan or low calorie weight loss diets for women with Polycystic Ovary Syndrome: A Randomized Controlled Feasibility Study

• HER Health: Healthy Eating for Reproductive Health Study


The purpose of the Healthy Eating for Reproductive Health (HER Health) study was to examine the effectiveness of two dietary approaches for weight loss among women with PCOS who were trying to conceive:

- a low-fat, low-glycemic index (GI) vegan diet with no caloric restriction (vegan)
- a standard, low-calorie diet (low-cal)
HER Health

• Why we conducted this study:
  – It is unknown whether this type of dietary approach may be useful for the treatment and management of PCOS.
  – To date, no studies have examined the impact of a vegan diet on weight loss and fertility outcomes among women with PCOS.
HER Health

- Overweight women with PCOS who were experiencing infertility were recruited to participate in a 6-month randomized weight loss study (n=18).
The HER Health study population
Baseline eating-related behaviors

• The 26-item Eating Behaviors Inventory (EBI) was used to assess behaviors associated with weight loss, weight gain, and weight loss maintenance
  – EBI scores range from 26 (very few eating behaviors supporting weight loss) to 130 (many eating behaviors related to weight loss).
• The Three-Factor Eating Questionnaire (TFEQ) was used to assess
  • Dietary restraint
  • Disinhibition
  • Susceptibility to hunger

EBI and TFEQ

Optimal score

EBI | Dietary restraint | Disinhibition | Susceptibility to hunger
---|-----------------|--------------|-----------------------------
30  | 50              | 60           | 70                          

This bar chart illustrates the scores for EBI, Dietary restraint, Disinhibition, and Susceptibility to hunger.
Baseline Quality of Life

- The PCOS Health-Related Quality of Life (PCOSQ) was used to assess five domains related to quality of life among women with PCOS:
  - Emotional health
  - Body hair
  - Infertility
  - Weight
  - Menstrual problems
PCOS-Q

Optimal score

Emotions
Body Hair
Weight
Infertility
Menstrual Problems
How this population differs from a similar population free of PCOS

• Examine if BMI, energy expenditure, EBI score, and dietary intake of HER Health participants differs from overweight women without PCOS who are not trying to conceive.

• Data from two previous weight loss interventions was used.
  – Female participants ages 18-35 were included (n=28)
  – Free of PCOS or other endocrine-related disorders (e.g., diabetes) and were not trying to conceive, were not pregnant, and were not breastfeeding
How this population differs from a similar population free of PCOS

- There were no differences in EBI or reported energy expenditure from physical activity.
- Participants in HER Health had a significantly greater BMI (39.9±6.1 kg/m²) than the comparison participants (33.4±5.7 kg/m², P=0.001).
### Diet: How this population differs from a similar population free of PCOS

<table>
<thead>
<tr>
<th></th>
<th>HER Health</th>
<th>Comparison</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate (g/day)</td>
<td>196.1±87.8</td>
<td>248.4±76.4</td>
<td>0.04</td>
</tr>
<tr>
<td>Fiber (g/day)</td>
<td>12.2±6.2</td>
<td>16.6±8.2</td>
<td>0.06</td>
</tr>
<tr>
<td>Iron (mg/day)</td>
<td>10.5±4.0</td>
<td>14.6 ±4.0</td>
<td>0.01</td>
</tr>
<tr>
<td>Whole grains (servings/day)</td>
<td>0.1±0.3</td>
<td>1.0±1.3</td>
<td>0.002</td>
</tr>
</tbody>
</table>
Main trial: HER Health

- Lots of work to do and lots of room for improvement!
HER Health: Methods

• Six month randomized weight loss intervention:
  – a low-fat, low-glycemic index (GI) vegan diet with no caloric restriction (vegan)
  – a standard, low-calorie diet (low-cal)

• Intervention delivery:
  – Nutrition counseling with an RD (2 sessions)
  – Weekly e-mail messages tailored to their weight loss
  – Weekly lessons on diet-related topics
  – Private Facebook groups
  – Provided with Luteinizing Hormone (LH) and pregnancy test strips
Intervention dietary recommendations

• Vegan:
  – Exclude all animal products (meat, fish, poultry, eggs, or dairy) and emphasize plant-based foods, such as fruits, vegetables, whole grains, and legumes/beans
  – Low Glycemic Index
  – Low fat
  – No restrictions on energy intake

• Low-cal
  – Daily caloric goal based on their current weight
  – Provided a book containing calorie and fat grams of common foods and instructions on self-monitoring diet
## HER Health Demographics

<table>
<thead>
<tr>
<th></th>
<th>Vegan</th>
<th>Low calorie</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td><strong>Age (mean years ± SD)</strong></td>
<td>28.1 ± 4.4</td>
<td>27.4 ± 5.0</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>4 (44%)</td>
<td>3 (33%)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0 (100%)</td>
<td>1 (11%)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤High school graduate</td>
<td>6 (67%)</td>
<td>6 (67%)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not married</td>
<td>3 (33%)</td>
<td>3 (33%)</td>
</tr>
</tbody>
</table>
# HER Health Demographics

<table>
<thead>
<tr>
<th></th>
<th>Vegan</th>
<th>Low calorie</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Diagnosed with insulin resistance with PCOS</td>
<td>4 (44%)</td>
<td>7 (78%)</td>
</tr>
<tr>
<td>Number of months trying to conceive prior to study enrollment</td>
<td>34.9 ± 30.9</td>
<td>31.6 ± 18.5</td>
</tr>
<tr>
<td>Number of pregnancies</td>
<td>0.2 ± 0.4</td>
<td>0.6 ± 0.7</td>
</tr>
<tr>
<td>Number of live births</td>
<td>0</td>
<td>0.2 ± 0.4</td>
</tr>
</tbody>
</table>
HER Health: Results

- Modest weight loss
- 3 months median percent weight loss (p=0.04):
  - Vegan: -1.8 (-5.0, -0.9)%
  - Low-calorie: 0 (-1.2, 0.3)%
- 6 months (P=0.39)—no difference
HER Health: Results

Median change in energy intake at 6 months (interquartile range)

Vegan

Low-calorie

P=0.02 for difference between groups
HER Health: Results

Median change in % energy from fat at 6 months (interquartile range)

Vegan

Low-calorie

P=0.02 for difference between groups
Social support via social media

• Use of Facebook groups was significantly related to weight loss at 3 ($P<0.001$) and 6 months ($P=0.05$).
HER Health: Strengths and Limitations

Strengths

• One of the most diverse samples ever used in a PCOS dietary intervention.
• Used a very minimal intervention approach, delivering the content mainly via e-mail and Facebook.

Limitations

• Small sample size (n=18)
• High attrition rate (67% attrition)
  – Usual attrition in weight loss studies is <30% at 12 months

HER Health: Conclusions

• Compared to a standard low calorie dietary approach, a low-fat, low-GI vegan diet produced:
  – significantly greater weight loss at three months
  – greater improvements in dietary intake at six months

• Adopting new diets may need greater support than was provided in this study.

• Important to find ways to allow for dissemination (technology approach) but provide the support and guidance patients need to make dietary changes.
OTHER PLANT-BASED RESEARCH RELATED TO HEALTH OUTCOMES ASSOCIATED WITH PCOS
Why Vegan?

• Why not
  – Vegetarian?
  – Pesco-vegetarian?
  – Semi-vegetarian?
  – Flexitarian?
  – Meatless on Mondays?
Adventist Health Study

European Prospective Investigation into Cancer and Nutrition (EPIC) study
Prevalence of type 2 diabetes and distribution of BMI by diet


Prevalence of type 2 DM (%)


N=83,031
Weight gain (g/year) over 5 years in 21,966 men and women in EPIC-Oxford by groups of diets as compared to reference group of meat eaters.
Dietary pattern and Metabolic Risk Factors. Mean-centered values are shown with whiskers representing SE. ANCOVA was used in comparing risk factors stratified by dietary patterns.

Rizzo N S et al. Dia Care 2011;34:1225-1227
Objective

• Objective was to use a randomized design to test the effects of five different plant-based dietary approaches on body weight and dietary intake.

• The New Dietary Interventions to Enhance the Treatments for weight loss (New DIETs) study was a 2-month weight loss intervention with a 4-month follow-up period.

Methods: Recruitment

Exclusion criteria

- Unstable medical status
- Uncontrolled thyroid condition, eating disorder, or a psychiatric illness
- Current alcohol or drug dependency treatment
- Medication for diabetes or insulin resistance
- Current participation in a weight loss program
- Pregnant/breastfeeding
- Unwilling to accept random assignment of diet

Inclusion criteria

- Overweight or obese (Body Mass Index (BMI) 25-49.9 kg/m²)
- 18 and 65 years old
- Have access to a computer with internet access to complete surveys
- Be available Monday - Thursday evenings in order to be assigned a group meeting day and attend weekly meetings
Flow of participants

Assessed for eligibility (n=219)

Wait-listed (n=54)
Participants qualified but study was filled

Excluded (n=90)
Couldn’t meet all 4 nights (n=30)
Unwilling to accept random diet assignment (n=8)
Did not meet study clinical criteria (n=52)

Invited to orientation (n=75)

Completed baseline assessment and randomized (n=63)
Randomized to one of five groups:

- **Omnivorous**
- **Semi-veg**
  - ≤ 1 serving red meat/week
  - ≤ 5 servings poultry/week
- **Pesco-veg**
- **Vegetarian**
- **Vegan**
Omnivorous
Semi-vegetarian
Semi-vegetarian
Pesco-vegetarian
Pesco-vegetarian
Vegetarian
Vegetarian
Vegan
Intervention: Months 0-2

All groups:
- Orientation and overview of diets in group meeting
- Diet information handouts
- Recipe books

- Vegan, vegetarian, pesco-veg, and semi-veg:
  - Weekly group meetings (8 total)

- Omnivorous group:
  - Monthly meetings (3 total)
  - Weekly newsletters
  - Weekly e-mails
Intervention: Months 3-6

• All groups, including the omnivorous group, met monthly face-to-face.

• All groups were provided with a private Facebook group for social support in between meetings.
Intervention: Group sessions

Classes based on topics from Diabetes Prevention Program and framed around Social Cognitive Theory.

- Diet and nutrition information
- Cooking demonstrations and food tastings
- Overcoming challenges:
  - Dining out on your diet
  - Grocery shopping tour
Methods: Assessments

• Assessments at baseline, 2 months, and 6 months:
  • Body weight (digital scale)
  • Height, baseline only (stadiometer)
  • Dietary intake (two days of unannounced 24-hour dietary recall using ASA24)
• Incentives for completion of all assessments at 2 months but not at 6 months.
• Participants told not to increase physical activity during initial 2 months of study.
Methods: Analysis

• ANOVA comparing percent weight loss among the 5 groups at 2 months (intensive intervention) and 6 months (reduced contact) were conducted.

• Intention-to-treat used for analysis: Weight gain imputed at a rate of 0.3 kg/month.
Methods: Analysis

• To test that weight loss would be incremental among the five groups (going from the vegan group losing the most to omnivores losing the least), an *a priori* linear contrast for trend was used at each time point.

• In addition, three *a priori* linear contrasts among the specific groups were examined at each time point: vegan versus omni, vegan versus semi-veg, and vegan versus pesco-veg.
RESULTS
Demographics

- 79% white
- 73% female
- 94% with a college degree
- Mean BMI: 35.0 kg/m$^2$
- Mean age: 48.7 years (range 42.7-53.0 years)
  - $P=0.02$ difference among five groups
Attrition didn’t differ by diet group but those who did not complete the study at 6 months were significantly younger (44.5±10.4 years) than those who completed (49.5±7.4 years; P=0.049).
Results: Percent weight loss (SE) during 6-month New DIETs trial by diet group

2 months:

- **Vegan**: significantly different from Omnivore (P = 0.01)

2 months: P < 0.01
Results: Percent weight loss (SE) during 6-month New DIETs trial by diet group

Baseline  | 2 months  | 6 months
---|---|---

**2 months:** Vegan sig diff from Omni (P=0.01)

**6 months:** Vegan sig diff from Pesco-veg, Semi-veg, and Omni (P’s<0.05)
Conclusions of New DIETs

• The findings point to a potential use of plant-based eating styles in the prevention and treatment of obesity and related chronic diseases.

• Significant weight loss occurred without the need for caloric restriction or dietary self-monitoring.
There are lots of ways to lose weight and prevent and treat chronic disease. Important to look beyond the scale...
DIET QUALITY AND DIETARY INFLAMMATION MARKERS
Dietary Quality as Measure for Chronic Disease Prevention

• Alternate Healthy Eating Index (AHEI): predictor of risk of cardiovascular disease and other major chronic diseases.

• AHEI score food categories:
  – vegetables (servings/day)
  – fruit (servings/day)
  – nuts and soy protein (servings/day)
  – ratio of white to red meat (grams)
  – cereal fiber (grams/day)
  – trans fat (% of energy)
  – ratio of polyunsaturated to saturated fatty acids (grams)
The Ornish plan was significantly different from the Atkins/100-g carbohydrate ($P=0.007$), Atkins/45-g carbohydrate ($P=0.0004$), South Beach/Phase 3 ($P=0.005$), and Weight Watchers (high CHO) compared to the New Glucose Revolution, Zone, 2005 Food Guide Pyramid, Akins (100 g CHO), South Beach (phase 3), and Atkins (45 g CHO).
Are there differences in diet quality among therapeutic diets for type 2 diabetes?

• 22-week RCT comparing low-fat, low GI vegan diet to ADA dietary recommendations.
Dietary Quality (AHEI index)

AHEI score was modestly, negatively correlated with changes in weight ($r = -0.27, P<0.01$).
Dietary Inflammatory Index

- The following were used to calculate the Dietary Inflammatory Index (DII):
  - Energy
  - Carbohydrates
  - Protein
  - Total fat
  - Unsaturated, monounsaturated, and polyunsaturated fat
  - Omega 3 and omega 6 fatty acids
  - Grams of alcohol
  - Fiber
  - Cholesterol
  - Vitamins B-1, B-2, B-6, B-12, A, C, D, and E
  - Iron
  - Magnesium
  - Zinc
  - Selenium
  - Folate
  - Beta-carotene
  - Caffeine

Dietary Inflammatory Index in New DIETs (adjusting for baseline)

2 months: Vegan, Veg, and Pesco-veg were all sig diff from Semi-Veg, P<0.05

6 months: P=0.97

CHANGES IN NUTRIENT INTAKE
Change in macronutrients at 6 months during New DIETs trial by diet group

** Vegan sig diff from semi-veg and omni, P<0.05

*** Vegan sig diff from pesco-veg, semi-veg, and omni; Veg diff from semi and omni, P<0.05

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Protein (%)
Carbohydrate (%)
Fat (%)
Sat fat (%)

Vegan
Vegetarian
Pesco
Semi
Omnivore

Change in cholesterol intake at 6 months during New DIETs trial by diet group

Cholesterol (mgs)

-235
-185
-135
-85
-35
-15

Vegan
Vegetarian
Pesco
Semi
Omnivore

*Vegan sig diff from pesco-veg, semi-veg, and omni, P<0.05
Transitioning to New Child-Care Nutrition Policies: Nutrient Content of Preschool Menus Differs by Presence of Vegetarian Main Entrée

Gabrielle M. Turner-McGrievy, PhD, MS, RD; Sarah B. Hales, MSW; Angela C. Baum, PhD


- Goal: Examine changes that occurred at a large preschool during the implementation of the SCABC standards.
- The nutrition content of menu items pre- (n=15 days; six of which were vegetarian) and post- (n=15 days; six of which were vegetarian) implementation of the new standards was compared.
Results

• Combining all meals, there were no significant differences between pre- and post-menus with the exception of a 0.3 cups/day increase in vegetables ($P<0.05$).
• Comparing vegetarian to non-vegetarian meals, vegetarian meals served at a preschool were higher in fiber and vegetables and lower in sodium and cholesterol than non-vegetarian meals.
IMPACTING OTHER HEALTH OUTCOMES SIMILAR TO PCOS
Metabolic Syndrome

• Elevated blood pressure, triglyceride level, and blood glucose
• Large waistline
• Low HDL cholesterol

Key Elements of Plant-Based Diets Associated with Reduced Risk of Metabolic Syndrome

Gabrielle Turner-McGrievy • Metria Harris
Metabolic Syndrome

• Goal of this review: to examine the association of plant-based dietary approaches with metabolic syndrome.

• Our review found
  – eight observational research studies
  – no intervention studies

• Most compared vegan or vegetarian diet to omnivorous diet

• Conducted mostly in Asian populations
From this review of studies on Metabolic Syndrome

• Vegan and vegetarian diets appear to have the most significant impact on:
  – blood pressure and fasting glucose
  – followed by waist circumference

• Vegan and vegetarian diets appear to have less impact on:
  – triglycerides and HDL cholesterol
Why would a vegan or vegetarian diet be potentially beneficial for Metabolic Syndrome?

• Some dietary components that are lower in the diets of vegetarians may influence metabolic syndrome risk:
  – energy intake
  – saturated fat
  – heme iron
  – red and processed meat

• In addition, plant-based diets may be higher in foods that are protective against the development of metabolic syndrome:
  – fruits and vegetables
  – fiber
ENVIRONMENTAL IMPACTS
Several studies have found a reduced environmental impact of plant-based diets vs. omnivorous diets:

- Adventist Health Study-2: vegetarian and semi-vegetarian diets were associated with significantly less greenhouse gas emissions than omnivorous diets.
- Estimated that omnivorous diets require 2.9 times more water, 13 times more fertilizer, 2.5 times more energy, and 1.4 times more pesticides than vegetarian diets, with beef consumption having the greatest impact on these factors.

Soret S, et. al. Am J Clin Nutr 2014; 100; 490S–495S
Several studies have found a reduced environmental impact of plant-based diets vs. omnivorous

- Research has also demonstrated a beneficial environmental impact of consuming legumes (peas and soybeans) for protein versus consuming meat (from animals raised on peas and soybeans).
- In a study using dietary intakes among French adults, animal products were the largest contributor to greenhouse gas emissions.

Land, irrigation water, greenhouse gas, and reactive, eggs, and dairy production

Beef pollutes more than pork, poultry, study says

WASHINGTON (AP) — Raising beef for the American dinner table does far more damage to the environment than producing pork, poultry, eggs or dairy, a new study says.

Compared with the other animal proteins, beef produces five times more heat-trapping gases per
N-footprint

• A nitrogen footprint describes the total amount of reactive nitrogen released to the environment as a result of an entity’s resource consumption, such as food.
Changes in N-footprint score at 2 and 6 months

*Vegan sig diff from Veg, Pesco-veg, and Omni at 2 and 6 months

I know what you’re thinking...
No one would ever like or stick to a vegan diet.
Percentage of New DIETs participants in each group meeting diet adherence criteria and 2 and 6 months

2 months: $X^2 = 5.2, P = 0.27$

6 months: $X^2 = 0.5, P = 0.98$
Percent weight loss at six months among non-adherent New DIETs participants

Percent weight loss

-14 -12 -10 -8 -6 -4 -2 0 2

Vegan/Veg (n=15)
Pesco-veg/Semi-veg (n=15)
Omnivorous (n=7)

P=0.04
P=0.06
Change in animal product intake among non-adherent New DIETs participants

Cholesterol (mg/day)

P=0.02
P=0.04
Impact of dietary preference and dislike

• Participants were asked which diet they preferred to receive and which one they did not want prior to randomization
  – No impact of dietary dislike or preference on dietary adherence
Dietary Adherence & Acceptability

• Dietary Adherence
  – Weight loss trial
    • 1 and 2 years: 61% vegan; 55% Step II
  – DM trial
    • 22 weeks: 67% vegan; 44% ADA
    • 74 weeks: 51% vegan; 58% ADA

• Hunger

• Acceptability
  • Food preparation/Dining out
I’d have no energy on a vegan diet.
RUNNER Research

• Research Understanding the Nutrition of Endurance Runners (RUNNER) study
• Survey of 422 distance runners (n=125 ultramarathon, n=152 full marathon, n=145 half marathon).
• Ultramarathon runners were almost twice as likely to report following a vegan/vegetarian diet than HALF and FULL marathoners combined ($B=1.94$, 95% CI=1.08, 3.48).
Vegan and vegetarian runners had higher diet quality scores than non-vegetarian runners (P<0.001) (as assessed by the Rapid Eating and Activity Assessment for Patients).
Vegan diets cost too much money.
Changes in weekly household grocery spending (adjusted for marital status)

2 months: $P=0.84$

6 months: $P=0.10$

But how will people get their protein, iron, calcium, ....
Nutrient intakes for the New DIETs study

- All participants in New DIETs had adequate protein, zinc, and vitamin B-12 at each time point, regardless of diet assignment.
- **Calcium:**
  - All participants had diets low in calcium at every time point, with the exception of the vegetarian group at two months.
- **Iron:**
  - Iron intake was low among all groups but did not differ by group.
  - Both randomized trials and observational studies have not found vegetarians and vegans to have lower iron intakes than omnivores.
You only get “certain people” into a vegan diet study.
Research report

Does the type of weight loss diet affect who participates in a behavioral weight loss intervention? A comparison of participants for a plant-based diet versus a standard diet trial

Gabrielle M. Turner-McGrievy, Charis R. Davidson, Sara Wilcox
New DIETS vs. Traditional diet intervention

<table>
<thead>
<tr>
<th></th>
<th>Traditional low calorie diet mPOD</th>
<th>Plant-based diets NewDIETs</th>
<th>P-value for difference between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n</strong></td>
<td>96</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td><strong>Study location</strong></td>
<td>Chapel Hill, NC</td>
<td>Columbia, SC</td>
<td></td>
</tr>
<tr>
<td><strong>Age (mean years ± SD)</strong></td>
<td>42.9 ± 11.2</td>
<td>48.5 ± 8.3</td>
<td>P=0.001</td>
</tr>
<tr>
<td><strong>Mean BMI (kg/m² ± SD)</strong></td>
<td>32.6 ± 4.7</td>
<td>35.2 ± 5.3</td>
<td>P=0.001</td>
</tr>
</tbody>
</table>

No differences in sex, race, education, or marital status between groups.
New DIETS vs. Traditional diet intervention

<table>
<thead>
<tr>
<th></th>
<th>Traditional low calorie diet mPOD</th>
<th>Plant-based diets NewDIETs</th>
<th>P-value for difference between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eating Behavior Inventory score</strong></td>
<td>72.6 ± 1.0</td>
<td>68.8 ± 1.2</td>
<td>P=0.08</td>
</tr>
</tbody>
</table>
# New DIETS vs. Traditional diet intervention

<table>
<thead>
<tr>
<th>Dietary intake</th>
<th>mPOD</th>
<th>NewDIETs</th>
<th>P-value for difference between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy intake (kcal)</td>
<td>1998.3 ± 82.3</td>
<td>2240.3 ± 102.6</td>
<td>P=0.08</td>
</tr>
<tr>
<td>Fat (% kcal)</td>
<td>37.2 ± 0.7</td>
<td>37.3 ± 0.9</td>
<td>N/A</td>
</tr>
<tr>
<td>Saturated Fat (% kcal)</td>
<td>11.8 ± 0.3</td>
<td>12.5 ± 0.4</td>
<td>N/A</td>
</tr>
<tr>
<td>Protein (% kcal)</td>
<td>16.6 ± 0.4</td>
<td>16.6 ± 0.5</td>
<td>N/A</td>
</tr>
<tr>
<td>Carbohydrate (% kcal)</td>
<td>45.5 ± 0.9</td>
<td>43.5 ± 1.1</td>
<td>N/A</td>
</tr>
<tr>
<td>Cholesterol (mg/day)</td>
<td>280.7 ± 18.1</td>
<td>313.3 ± 22.6</td>
<td>N/A</td>
</tr>
<tr>
<td>Fiber (g/day)</td>
<td>16.2 ± 0.8</td>
<td>18.4 ± 1.0</td>
<td>N/A</td>
</tr>
<tr>
<td>Calcium (mg/day)</td>
<td>908.7 ± 48.9</td>
<td>988.3 ± 61.0</td>
<td>N/A</td>
</tr>
<tr>
<td>Iron (mg/day)</td>
<td>13.8 ± 0.7</td>
<td>16.4 ± 0.9</td>
<td>N/A</td>
</tr>
<tr>
<td>Vitamin A, RAE (mcg RAE/day)</td>
<td>604.2 ± 36.0</td>
<td>741.6 ± 44.9</td>
<td>N/A</td>
</tr>
<tr>
<td>Vitamin C (mg/day)</td>
<td>85.6 ± 5.9</td>
<td>63.4 ± 7.4</td>
<td>P=0.02</td>
</tr>
<tr>
<td>Added sugar (tsp/day)</td>
<td>15.7 ± 1.3</td>
<td>13.6 ± 1.6</td>
<td>P=0.34</td>
</tr>
<tr>
<td>Fruit (cups/day)</td>
<td>1.0 ± 0.1</td>
<td>0.8 ± 0.1</td>
<td>N/A</td>
</tr>
<tr>
<td>Vegetables (cups/day)</td>
<td>1.8 ± 0.1</td>
<td>1.7 ± 0.1</td>
<td>N/A</td>
</tr>
<tr>
<td>Servings of meat (oz/day)</td>
<td>4.2 ± 0.3</td>
<td>5.3 ± 0.4</td>
<td>N/A</td>
</tr>
<tr>
<td>Servings of dairy (cups/day)</td>
<td>1.7 ± 0.1</td>
<td>1.8 ± 0.2</td>
<td>N/A</td>
</tr>
</tbody>
</table>
WHY USE PLANT-BASED APPROACHES IN PUBLIC HEALTH?
Appeal of plant-based dietary approaches

- No need for dietary self-monitoring
- Participants can eat until they are full
- Improvements in diet quality
- Complete adherence may not be necessary
Appeal of plant-based dietary approaches

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Appeal of plant-based dietary approaches

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- Participants can eat until they are full
- Improvements in diet quality
- Complete adherence may not be necessary

Vegan
Vegetarian
Pesco-Vegetarian
Semi-Vegetarian
Omnivorous
Working with patients/clients
Refer to a registered dietitian

- Vegetarian Nutrition Dietetic Practice Group of the Academy of Nutrition and Dietetics
  - [http://vegetariannutrition.net/](http://vegetariannutrition.net/)
Focus on carbohydrate type

- Whole, plant-based foods
- High fiber
- Glycemic index
Glycemic Index: Red, Yellow, Green

- White bread, most dry cereals, baking potatoes
- Wheat bread, shredded wheat
- Pumpernickel, barley, oats, pasta, sweet potatoes, beans
Keep it simple

• Provide a list of foods to avoid and foods to consume regularly.
• Provide sample meal plans and grocery list ideas.
Be firm, but not forever

• Never say forever.
  – Forever may feel too long so tell patients to adhere to diet until next HgbA1C, weight, insulin, or lipids check.
Provide support

- Listservs
- Group meetings
- E-mail tips
- Buddy systems
- Social media

“"I belong to a weight loss support group. We meet once a week and talk each other out of dieting.""
Engagement with Facebook was significantly associated with weight loss during the 4-month maintenance period ($B = -0.09$, $P = 0.04$).
Don’t let them leave empty handed

- Food samples
- Recipes
- Eating out tips
- Grocery store tour handouts
- Menu plans
Not a matter of which diet won.
• Plant-based diets are another tool in our toolbox for helping people achieve healthy body weights.

• There are lots of different diets out there that produce weight loss.

• Important to look beyond weight loss and examine diets that also protect against polycystic ovary syndrome, cardiovascular disease, diabetes, cancer, and other chronic diseases.
Challenges to plant-based research

- Funding for plant-based research
- Conveying your research to reviewers
- Trained nutrition experts to assist with research
Cycling back to PCOS

• Challenges to PCOS-related dietary intervention work
  – Funding
  – Attrition
  – Oral contraceptives
  – Finding knowledgeable, energetic, and motivated clinical partners
Prior weight loss attempts among HER Health participants

• All participants reported trying some type of weight loss diet prior to enrolling in the study
  – Mean of 1.7±0.9 diets tried prior to study enrollment
• Type of weight loss approach tried prior to study enrollment:
  – Low calorie diet (n=9, 50%)
  – Exercise alone (n=6, 33%)
  – Low carbohydrate/high protein diet (n=4, 22%)
  – General healthy diet (n=4, 22%)
  – Eliminating certain foods (e.g., high sugar foods) (n=4, 22%)
Partnering with clinicians will be vital for PCOS work to move forward

- The majority of participants in HER Health (78%) reported having a physician recommend weight loss to them prior to entering the study.
Prevalence of body mass index and body weight cut-off points for in vitro fertilization treatment at U.S. clinics and current clinic weight loss strategy recommendations

GABRIELLE M. TURNER-MCGRIEVY & BREÁNNA L. GRANT

Department of Health Promotion, Education, and Behavior, Arnold School of Public Health, University of South Carolina, Columbia, SC, USA
Use of BMI cut-points for IVF treatment

• In the United States, establishing BMI cut-points is largely left up to the individual clinic as there are no formal guidelines for providing IVF for overweight and obese women.

• Anecdotally, there are reports that many IVF clinics have BMI cut-points that limit either overweight or obese women from receiving IVF treatment.

Campbell M. 
Use of BMI cut-points for IVF treatment

- Elevated BMI is related to poorer outcomes with assisted reproduction, particularly in IVF.
- Overweight and obese women may have an impaired response to gonadotropins and reduced implantation, pregnancy, and live birth rates following IVF as compared to normal weight women.

Purpose of IVF clinic survey

• Assess use of BMI or body weight cut-points
• Examine what weight loss strategies clinics are recommending to patients
• 379 clinics contacted and 347 responded (92% response rate)
BMI/Body weight cut-points Quiz

• What percentage of U.S. fertility clinics use a BMI or body weight cut-point to determine eligibility for IVF treatment?
  A. None
  B. About 1/3
  C. About 1/2
  D. Almost all
Survey of U.S. IVF clinics

- 35% (n=120) reported using a BMI or body weight cut-point to determine eligibility for IVF treatment.
- Mean BMI (±SD) cut-point was 38.4 ± 5.2 kg/m$^2$ and mean body weight (±SD) cut-point was 130.2 ± 14.8 kg.
Survey of U.S. IVF clinics

• Of the clinics using a set cut-point, approximately half (46%) provided no weight loss recommendations for patients.
Of those clinics with a set cut-point...

<table>
<thead>
<tr>
<th>Weight loss resources recommended to patients among clinics with a BMI or weight cut-point or preference</th>
<th>n=</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to local resources</td>
<td>33 (22%)</td>
</tr>
<tr>
<td>Refer to commercial program</td>
<td>15 (10%)</td>
</tr>
<tr>
<td>Multiple recommendations given</td>
<td>9 (6%)</td>
</tr>
<tr>
<td>Recommendation provided after initial patient consult</td>
<td>7 (4%)</td>
</tr>
<tr>
<td>Refer to website or book</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>Recommend low carb diet</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>Recommend standard, reduced calorie diet</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>In-house counseling or weight loss program provided</td>
<td>5 (3%)</td>
</tr>
</tbody>
</table>
Treating overweight women seeking infertility treatment: A unique population

- Women experiencing infertility and undergoing infertility treatment experience high rates of anxiety and depression.
- Women with PCOS also experience high rates of emotional distress and depression.
- Women often avoid discussing their challenges with infertility with others due to fear of stigmatization.

Need for programs specifically designed for women experiencing infertility

• If physicians are recommending weight loss prior to treatment, this is a prime time to provide patients with an effective, healthy weight loss program.

• Remotely-delivered program allows for scaled-up delivery and anonymity during treatment.

• Women undergoing infertility treatment rely heavily on the internet to provide both social support and information.
The time is now for plant-based research studies and programs!
The time is now for research in this area

• The Scientific Report of the 2015 Dietary Guidelines Advisory Committee was recently released and mentions vegetarian diets 114 times.
  – Only observational studies were cited, with no randomized, behavioral interventions examining plant-based eating styles.

• While observational studies can suggest potential relationships between self-selected diet and health outcomes, only well-designed RCTs will be viewed by most scientists as sufficiently compelling to provide evidence regarding the effects of adopting plant-based diets.
Current research

• IMAGINE study: Examining the effect of a one-year plant-based dietary intervention on systemic inflammation.
  – Cooking classes
  – Physical activity
  – Stress management
• PIs/Collaborators: Drs. James Hébert, Michael Wirth, and Nitin Shivappa
• Project manager/Interventionist: Trisha Mandes, MS, MPHN
Let’s partner!
Thank you!

- HER Health and New DIETs Collaborators
  - Deborah Billings, PhD
  - Sara Wilcox, PhD
  - Charis Davidson, MPH
  - Ellen Wingard, MSPH, RD
  - Edward Frongillo, PhD

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