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**NUTRITIONAL STRATEGIES TO REDUCE CARDIOMETABOLIC RISK**

**Disclosure**

- Received honoraria for lectures and program development from Abbott Nutrition International
Outline

- What is cardiometabolic risk?
- Nutrition and type-2 diabetes
- Nutrition and dyslipidemia
- Nutrition and overweight/obesity
- Nutrition and hypertension
- Nutrition, residual risk, and metabolic syndrome
- Practical tips
- Conclusions

Cardiometabolic Perspective

- First use of “cardiometabolic” in paper by Reiz et al. in 1979
- First use “cardiometabolic health” and “– disease” linking components of metabolic syndrome with cardiovascular disease by Pescatello in 1999
- subsequently “cardiometabolic syndrome” equated with metabolic syndrome
- And eventually, “cardiometabolic risk” referred to systematic risk assessment for cardiovascular disease and type-2 diabetes, using lifestyle modification and weight loss as interventions
3Q3.2.2. Medical Nutrition Therapy

- **R40.** For adults, AACE recommends a reduced-calorie diet consisting of fruits and vegetables (≥5 servings/day) (**Grade A; BEL 2**), grains (≥6 servings/day, one-third of those as whole grains), fish, and lean meats (**Grade B; BEL 2**). Intake of saturated fats, trans fats, and cholesterol should be limited, while LDL-C–lowering macronutrient intake should include plant stanols/sterols (~2 g/day) and soluble fiber (10-25 g/day) (**Grade A; BEL 1**).

- **R41.** AACE recommends primary preventive nutrition in all healthy children older than 2 years (**Grade A; BEL 4**).
### Table 12: Lifestyle Therapy

Evidence based lifestyle therapy for treatment of obesity should include three components

<table>
<thead>
<tr>
<th>DIET (R64, R65, R66)</th>
<th>PHYSICAL ACTIVITY (R64, R67, R68, R69, R70, R71)</th>
<th>BEHAVIOR (R64, R72, R73, R74, R75)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced calorie healthy meal plan</td>
<td>Voluntary aerobic exercise progressing to ≥ 150 min/week moderate intensity in 3-5 daily sessions</td>
<td>An interventional ‘package’ that includes any number of the following:</td>
</tr>
<tr>
<td>~500-750 kcal daily deficit</td>
<td>Resistance exercise: single-sets involving major muscle groups, 2-3 times per week</td>
<td>- Self monitoring (food intake, exercise, weight)</td>
</tr>
<tr>
<td>Individualize based on personal and cultural preferences</td>
<td>Reduce sedentary behavior</td>
<td>- Goal setting</td>
</tr>
<tr>
<td>Meal plans can include: Mediterranean, DASH, Low-carb, Low-fat, Volumetric, High protein, Vegetarian</td>
<td>Individualize program based on preferences and take into account physical limitations</td>
<td>- Education</td>
</tr>
<tr>
<td>Meal replacements</td>
<td>Team Member or Expertise: Dietitian, Health educator</td>
<td>- Problem solving strategies;</td>
</tr>
<tr>
<td>Very low calorie diet</td>
<td>Team Member or Expertise: Exercise trainer, Physical activity coach, Physical/Occupational therapist</td>
<td>- Stimulus control</td>
</tr>
</tbody>
</table>

Team Member or Expertise:
- Health educator, Behaviorist, Clinical Psychologist, Psychiatrist
Table 11. Association of Eating Patterns and Macronutrient Composition on Weight Loss Efficacy

<table>
<thead>
<tr>
<th>Eating Pattern or Macronutrient Change</th>
<th>Effect</th>
<th>Reference (EL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low glycemic index/load</td>
<td>- increased satiety</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- improved glycemic control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- increased gut health</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- increased satiety</td>
<td>2111</td>
</tr>
<tr>
<td></td>
<td>- increased satiety</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- no incremental effect on weight loss</td>
<td></td>
</tr>
<tr>
<td>Low carbohydrate</td>
<td>- improved glycemic status and lipids</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- improved cardio-metabolic risk factors</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- lower risk of cardiovascular disease</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- no incremental effect on weight loss</td>
<td></td>
</tr>
<tr>
<td>High protein</td>
<td>- longer benefit on WC, BMI</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- improved cardio-metabolic risk factors</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- lower risk of cardiovascular disease</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- less relative loss of muscle mass</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- no incremental effect on weight loss</td>
<td></td>
</tr>
<tr>
<td>Moderate carbohydrate – moderate protein</td>
<td>- improved body composition, LDL, apoB</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- no incremental effect on weight loss</td>
<td></td>
</tr>
<tr>
<td>Low fat</td>
<td>- beneficial/efficacy on lipids</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- beneficial on lipids replacing with unsaturated fat</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- improved renal function</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- no incremental effect on weight loss</td>
<td></td>
</tr>
<tr>
<td>High fat</td>
<td>- with sodium when hypotensive, great weight loss compared with hypolipoprotein-low carbohydrate diet</td>
<td>4021</td>
</tr>
<tr>
<td>Mediterranean-style</td>
<td>- decreased risk of cancer</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- EVOD supplementation - no effect on weight</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- reduced cardiovascular risk factors</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- reduced markers of inflammation</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- improved hepatic, visceral and insulin sensitivity</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- improved renal function</td>
<td>1211,2111(2011)</td>
</tr>
<tr>
<td></td>
<td>- no incremental effect on weight loss</td>
<td></td>
</tr>
</tbody>
</table>

* Abbreviations: EL – evidence level, EVOD – extra virgin olive oil, MDR – metabolic syndrome, ppINS – postprandial insulin response

** WC – waist circumference

Incremental effect in comparison to a treatment control diet does not occur or is insignificant

\( \text{ppINS} \) is not significantly different from baseline

\( \text{2 year} \) refers to a 2-year intervention period

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Dietary Patterns and Blood Pressure in Adults: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

Rhoda N Ndanuka,*,1 Linda C Tapsell,2 Karen E Charlton,2 Elizabeth P Neale,2 and Marijka J Batterham2

1School of Medicine and 2Statistical Consulting Service, School of Mathematics and Applied Statistics, University of Wollongong, Wollongong, Australia

ABSTRACT

Hypertension is a major risk factor for developing cardiovascular disease, stroke, and kidney disease. To lower blood pressure (BP), several lifestyle changes are recommended such as weight loss, exercise, and following a healthy diet. Investigating the effect of single nutrients may have positive results, but food is consumed as part of a whole diet, resulting in nutrient interactions. The aim of this systematic review and meta-analysis was to assess the effect of dietary patterns on BP in adults. Studies that were published between January 1999 and June 2014 were retrieved using Scopus, Web of Science, and the MEDLINE database. Seventeen randomized controlled trials were included in the meta-analysis. The results suggest that healthy dietary patterns such as the Dietary Approaches to Stop Hypertension diet, Nordic diet, and Mediterranean diet significantly lowered systolic BP and diastolic BP by 4.6 mm Hg and 2.38 mm Hg, respectively. These diets are rich in fruit, vegetables, whole grains, legumes, seeds, nuts, fish, and dairy and low in meat, sweets, and alcohol. Lifestyle factors such as exercise and weight loss in combination with dietary changes may also reduce BP. Further research is needed to establish the effect of dietary patterns on BP in different cultures other than those identified in this review. The review was registered on PROSPERO (International prospective register of systematic reviews) as CRD42015016272. Adv Nutr 2016 7(6):76-89.
FIGURE 4 Forest plot of effect of the different dietary patterns in 17 randomized controlled trials on diastolic blood pressure (mm Hg). DASH, Dietary Approaches to Stop Hypertension; N, inverse variance.

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**Daily and Weekly DASH Eating Plan Goals for a 2,000-Calorie-a-Day Diet**

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Daily Servings</th>
<th>Weekly Servings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains</td>
<td>6–8</td>
<td></td>
</tr>
<tr>
<td>Meats, poultry, and fish</td>
<td>6 or less</td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>4–5</td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td>4–5</td>
<td></td>
</tr>
<tr>
<td>Low-fat or fat-free dairy products</td>
<td>2–3</td>
<td></td>
</tr>
<tr>
<td>Fats and oils</td>
<td>2–3</td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>2,300 mg*</td>
<td></td>
</tr>
<tr>
<td>Nuts, seeds, dry beans, and peas</td>
<td>4–5</td>
<td></td>
</tr>
<tr>
<td>Sweets</td>
<td>5 or less</td>
<td></td>
</tr>
</tbody>
</table>

https://www.nhlbi.nih.gov/health/health-topics/topics/dash#
The Nordic diet emphasizes:

- Locally grown
- Sustainable food sources
- Mainstream nutritional science
- Increase consumption
  - Fruits, berries, vegetables, legumes, potatoes, whole grains, nuts, seeds, rye breads, fish, seafood, low-fat dairy, herbs, spices, canola oil
- Moderation
  - Game meat, free-range Eggs, cheese, yogurt
- Rare
  - Other red meat and fats
- Never
  - Sugary, processed food
  - Additives, refined fast food

https://authoritynutrition.com/the-nordic-diet-review/
PRINCIPLES OF A TIBETAN DIETARY PATTERN

1. Vegetarian
2. Daily schedule
3. No snacking
4. No sneaking
5. Desserts only special occasions
6. Home cooked meals
7. Eat after meditation
8. Eat in silence
9. Porridge for breakfast
10. Help with meal preparation


**TIBETAN MEAL PLAN**

**Sample Healthy Menu**

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>1/2 cup porridge with 1 tab crushed walnuts</td>
<td>1 poached egg on 1 slice toast with mushrooms, tomatoes and basil</td>
<td>1/2 cup porridge with tab crushed walnuts, 1 tab rice bran, 1/2 cup soy milk</td>
<td>1 slice toast with 1 cup pressed mushrooms, 2 asparagus spears, home made baked beans</td>
<td>Breakfast smoothie: 1 cup soy milk, protein powder, 1/2 banana, 1/2 cup berries</td>
<td>1 poached egg on 1 slice toast with 1 cup bake French toast, with 1 tab of 100% heat jam</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late morning snack</td>
<td>2 whole carrots with 1/4 cup fat-free hummus</td>
<td>5 sticks celery and five blueberries</td>
<td>1 pear and 4 brazil nuts</td>
<td>1 cup strawberries and 1 tab soy yogurt</td>
<td>5 sticks celery and five blueberries</td>
<td>1 brown rice cake with 1 tab goats feta, 1/2 pear and 1 tsp pumpkin seeds</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late lunch</td>
<td>1 grilled fish with 3 cups of 8-veg salad</td>
<td>Roast chicken with 7-veg wrap with herbs</td>
<td>1.5 cups lentil and 7-veg soup and herbs</td>
<td>Leftover steak and 7-veg salad wrap, 1 orange</td>
<td>5 sticks celery and five blueberries</td>
<td>1 cup fat-free hummus and 1/2 cup salad with extra 1/2 cup vegetable and herbs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afternoon snack (if needed)</td>
<td>2 rice crackers with goats cheese and 2 strawberries</td>
<td>1 carrot and small serve homemade hummus dip</td>
<td>1 orange and 5 almonds</td>
<td>1 pear and 4 brazil nuts</td>
<td>1 pear and 4 brazil nuts</td>
<td>5 sticks celery and five blueberries</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dinner</td>
<td>Roast chicken breast with 7 veg, extra cooked eggplant, pumpkin and allie veg for lunches</td>
<td>1.5 cups lentil and 8-veg soup and 1/2 cup cooked wild rice</td>
<td>Mesquite fish fillet with sauce of 3-bean salad, 1/2 cup corn taco shells, 4 salad veg, 1 small serve of sago</td>
<td>Grilled hawaiian chicken with lean ham, pineapple and 1/2 cup cooked brown rice, 1 small serve of sago</td>
<td>Grilled chicken sausages with mashed sweet potato, green beans and another 1/2 cup 8-veg soup</td>
<td>100g steak with 1/2 cup 8-veg soup and 1/2 cup cooled wild rice</td>
</tr>
</tbody>
</table>

* this sample menu is a guide only. It does not consider your specific calorie and health needs, allergies, food intolerances, seasonal food availability, or budget.
What is Metabolic Syndrome? (MetS)

- Complex, pathophysiological state
- Comprised of a cluster of clinically measured and unmeasured risk factors
- Progressive course
- Associated with serious co-morbidities
  - Global CV risk
  - Multi-organ damage
- Under-recognized clinically
- Variable phenotypic expression
- Controversial
Other elements (residual risk)

- Apo B
- Small LDL size
- Endothelial dysfunction
- Insulin resistance
- Pro-thrombotic
- Pro-inflammatory
- Factor analysis: clustering of risks accounts for 37-70% of factor loading patterns
- CVD risk rises exponentially as number of factors increase = “interactions” and “systems effect”
- CVD risk higher MetS + T2D vs. T2D alone (Framingham Offspring Study)
- Biological complexity
- Transcultural factors
The epidemiological concept of residual risk

Diego Vanuzzo

Abstract Residual cardiovascular risk can be defined as the residual risk of incident vascular events or progression of established vascular damage persisting in patients treated with current evidence-based recommended care including the risk that established from risk factors, such as dyslipidemia, high blood pressure, and the risk related to emerging or newer risk factors.

Residual risk for secondary ischemic events in patients with atherothrombotic disease: Opportunity for future improvements in patient care

CARL J. PEPINE


- RELATIVE RISK BETWEEN GROUPS
- RESIDUAL RISK FOR RECURRENCE
Reducing residual risk: modern pharmacochemistry meets old-fashioned lifestyle and adherence improvement

Richard Kones

The American Heart Association’s Diet and Lifestyle Recommendations

To get the nutrients you need, eat a dietary pattern that emphasizes:

- fruits, vegetables,
- whole grains,
- low-fat dairy products,
- poultry, fish and nuts,
- while limiting red meat and sugary foods and beverages.

http://www.heart.org/HEARTORG/GettingHealthy/NutritionCenter/Healthy_sociations-Diet-and-Lifestyle-Recommendations_UCM_305855_Article.jsp
1. Age, gender, etc.
2. Transcultural factors
3. Molecular nutrition

Transcultural Factors

- Genetic/epigenetic
- Anthropometrics
- Food sourcing
- Culinary styles
- Eating patterns
- Physical activity
- Tobacco use
- Alcohol use
- Psychological stress
- Personal behaviors
- Dietary supplement use
- Pollution
- Endocrine disruptors
- Health care practices
- Public advocacy
- Medical school curricula
- Research methodology
- Governmental policy
- Regulatory agencies
- Politics
- Socio-economic factors
- Religion
A template to provide node-specific and table-specific transculturalization

- India
- Southeast Asia
- Canada
- Malaysia
- Brazil
- Persian Gulf
- Mexico
- Venezuela
TRANSCULTURALIZATION RECOMMENDATIONS FOR DEVELOPING LATIN AMERICAN CLINICAL PRACTICE ALGORITHMS IN ENDOCRINOLOGY—PROCEEDINGS OF THE 2015 PAN-AMERICAN WORKSHOP BY THE AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS AND AMERICAN COLLEGE OF ENDOCRINOLOGY

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Nutritional Medicine

- “Nutrition” = the interaction of diet (environment) and metabolism (body)
- “Molecular Nutrition” = the complex interaction of nutrient molecules and target metabolome/epigenome molecules
- “Eating Pattern” = the aggregate of nutrients (as foods or molecules) over a specified period of time
- “Dietary Supplements” (DS) = molecules specified by the 1994 DSHEA
- “Nutraceuticals” (N) = high concentration DS
- “Endocrine Disrupting Compound” (EDC) = molecules that have negative effects on target networks
- “Nutrient” = molecules that have positive effects on target networks

Context

- Current aspects of nutritional medicine have failed to significantly bend the prevalence rate curves for metabolic diseases (obesity, type-2 diabetes, cardiovascular, etc.)
- This failure occurs in practice, research, and education, on domestic and global scales
- Perhaps the failure results from the premise that one or two focused interventions will have a significant impact on a physiological state
- Perhaps the solution is to recognize “complexity” as normative and therefore view interventions as network-network interactions
Molecular and transcultural nutrition

Table 1 Examples of molecular targeted nutritional therapies for cardio-metabolic disease

<table>
<thead>
<tr>
<th>Disease</th>
<th>Pathways</th>
<th>Molecular targets</th>
<th>Potential therapeutic molecular nutrients</th>
<th>Whole foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>Insulin signal transduction</td>
<td>P6K, GSK3, IR</td>
<td>Cinnamaldehyde, Chromium, Vanadium</td>
<td>Cinnamon, Wheat germ, Apples, Mushrooms</td>
</tr>
<tr>
<td>Obesity</td>
<td>Adipose tissue inflammation/differentiation</td>
<td>AMPK, IFNγ, IL-6, MCP, PPARγ</td>
<td>Genistein, Resveratrol, Quercetin, Epigallocatechin, n-3-linolenic acid, 125-vitamin D</td>
<td>Blueberry, Grape (red wine), Cinnamon, Soybeans, Apples, Onions, citrus fruits, Green tea, Black currant seed, Salmon, Garlic</td>
</tr>
</tbody>
</table>
FLAVOR NETWORKS

MOLECULAR GASTRONOMY
Cardiometabolic network associated with physical fitness

The nutriomics model of molecular nutrition

Foods

Human subject

Ph1

Ph2

Ph3

Ph4

Ph5

Ph6

Ph7

Ph8

Ph9

Ph1-1

Ph1-2

Ph1-3

Ph1-4

Ingestion

Digestion

Food metabolome

Microbial metabolome

Endogenous metabolome

M1

M2

M3

M4

M5

M6

M7

M8

M9

M10

M11

M12

M13

M14

M15
The Adipokine-Cardiovascular Network
Dietary Patterns

- Dietary Guidelines for Americans
- Dietary Approaches to Stop Hypertension
- Mediterranean Diets
- Popular Diets
  - Atkins
  - Ornish
  - Zone
  - South Beach
  - Paleo
  - Vegan
Practical Tips

- Get personal histories and preferences
- Physician personal behaviors
- Avoid using abstract quantifiers (e.g., calories and grams)
- Use easy descriptors (e.g., palm size, “small”, cup, etc.)
- Familiarize and demonstrate web-based (free) resources for patients (e.g., DASH, Mediterranean)
- Teach food safety and basic cooking
- Make shopping lists (shop for food after meals)
- Teach how to read nutrition facts labels
Case Discussion

- 50 year Hasidic Rabbi with metabolic syndrome, CKD-3a, multiple stents, no tobacco
  - BMI 32
  - BP 152/96 (on losartan-HCTZ)
  - LDL-c 162 (on atorvastatin)
  - A1c 9.2% (on metformin and glyburide)
- Lots of stress, difficulty sleeping, always tired, and eager to feel better
- What is your approach?
Lifestyle Medicine

- Nutrition
  - Target individual cardiometabolic risk factors
  - Target residual risk (eating patterns)
- Physical Activity
- Sleep hygiene
- Stress reduction and behavior
- Tobacco cessation
- Alcohol and substance abuse treatment

Nutritional Medicine Approach (For Discussion)

- Conversation and trust – how?
- Motivational interviewing – how?
- Underlying behaviors – how?
- Identify actionable obstacles/challenges – how?
- Structure – what kind?
- Transcultural factors – which ones?
- Formulate Dietary Pattern (individualize) – how?
- Self-management – use resources – how? where?
- Other points?
Conclusions

- Nutritional medicine is a vital part of lifestyle medicine, which in turn, is vital to nearly all types of patient encounters
- Cardiometabolic risk factors can be reduced with effective implementation of nutritional counseling
- There are many web-based resources available for health care professionals to learn from and also to provide directly to patients to optimize care