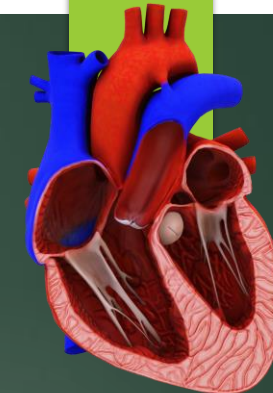


Plant based diets and cardiovascular health



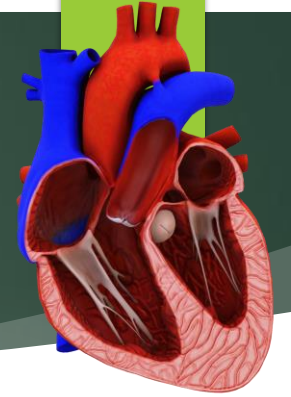
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Disclosure slide

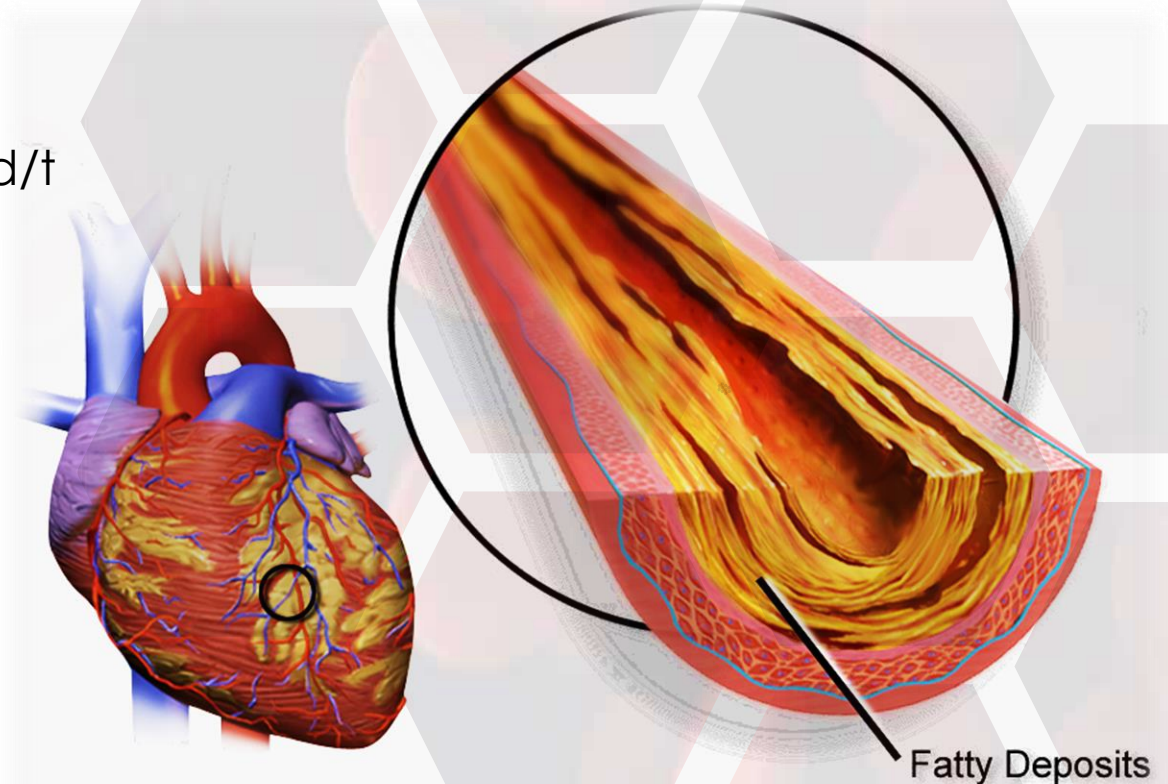
I have no financial disclosure of conflicts of interest with the presented material in this presentation



Coronary Artery Disease



- ❑ Involves atherosclerotic plaque formation.
- ❑ Decreased oxygen delivery to myocardium and d/t impairment in blood flow.
- ❑ Demand/supply mismatch
- ❑ Major cause of death in the USA and worldwide

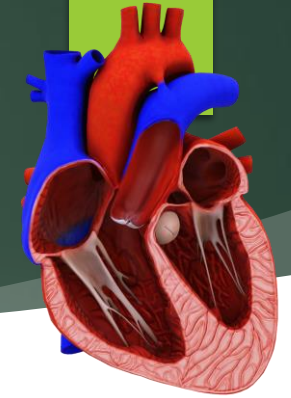


Atherosclerosis



- ❑ Clinical **atherosclerosis** = end result of a disease that develops slowly over many decades
- ❑ Often a silent asymptomatic disease until it suddenly presents as a MI, chronic ischemia, or claudication.
- ❑ Sudden plaque rupture can be fatal 1/3 of the time
- ❑ The PDAY study:
 - ❑ atherosclerosis begins in childhood
 - ❑ young adults often have “significant lesions”
 - ❑ even at a young age the development of atherosclerosis is associated with risk factors hyperlipidemia, tobacco, obesity, abdominal fat, DM, HTN

Multifactorial Phenomenon

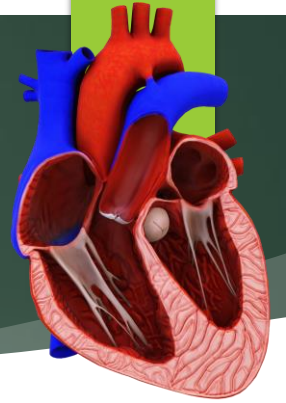


- ❑ Non-modifiable
 - ❑ Gender, age, family history, genetics
- ❑ Modifiable
 - ❑ Smoking, obesity, lipid levels, psychosocial variables



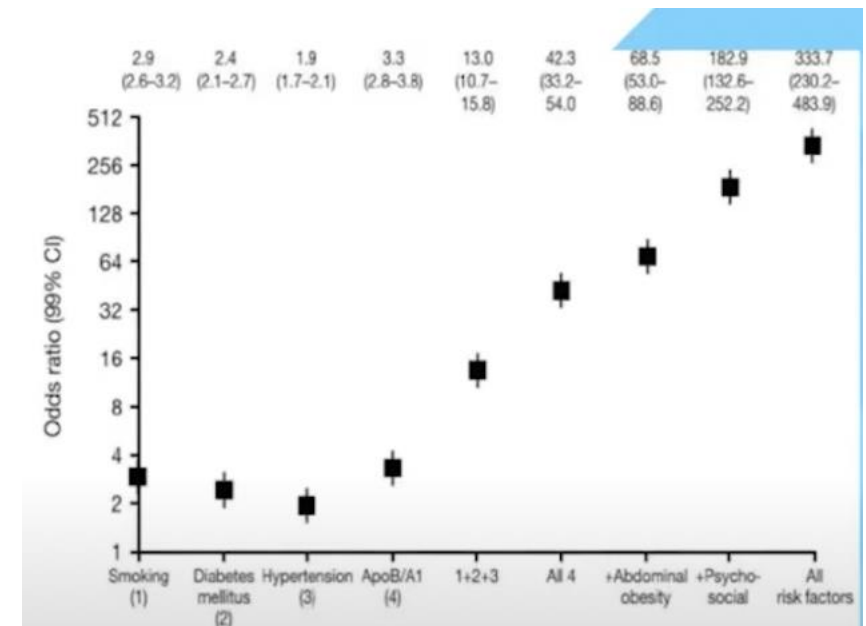
- ❑ Fast past lifestyle/western world
 - ❑ Higher incidence of fast food
 - ❑ Higher prevalence of ischemic heart disease
- ❑ Hypercholesterolemia is an important modifiable risk factor.
- ❑ Higher LDL
 - ❑ Higher risk for CAD
 - ❑ A higher HDL decreased risk for HDL

INTERHEART



- Over 90% of risk in men and 94% risk in women could be attributed to nine risk factors (p=0.0001):
 - Smoking
 - Raised ratio of apo B to apo A-1 (LDL-c to HDL-c)
 - HTN
 - Diabetes
 - Abdominal obesity
 - Adverse psycho-social risk factors

Dyslipidemia- responsible for more than 50% of the population attributable vascular risk



Epidemiology

- ❑ Cardiovascular disease is the leading cause of death in the United States
- ❑ U.S obesity prevalence was 41.9% in 2017-march 2020 (NHANES, 2021).
- ❑ Between 2018-2019- 251 billion dollars spent in direct costs and \$155.9 billion in lost productivity/mortality



Saturated and Unsaturated Fatty Acids

Saturated

- ❑ Saturated fatty acids may interact with the gut microbiome to promote translocation of lipopolysaccharide = potent pro-inflammatory endotoxin into blood stream

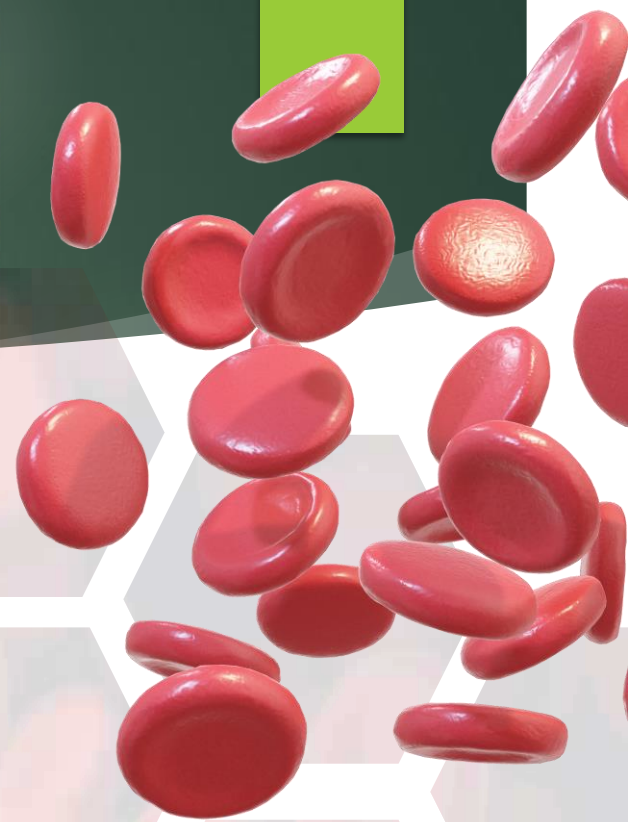


Unsaturated

- ❑ High unsaturated fat and low saturated fat = anti-inflammatory effects, insulin sensitivity and reduction of CVD



Animal Foods



- ❑ Increased cardiovascular endpoints
- ❑ **24% lower mortality** of CHD in vegetarians relative to omnivores
- ❑ Heme iron found in animal foods (red meat, poultry, and seafood) = an increased risk of cardiovascular disease and insulin resistance
- ❑ Postulated that oxidative potential of iron = reactive oxygen species and oxidative stress could be the cause
- ❑ Sodium, nitrates and nitrites used to preserve meats may also increase cardiovascular outcomes through increased BP, impaired insulin response and endothelial dysfunction

What about lean meat?



- ❑ RCT compared the effects of white meat, red meat and nonmeat protein sources on atherogenic lipoprotein measures
- ❑ Study used generally healthy men/women 21-65 y/o randomized to either high SFA/low SFA and within each to red meat, white meat, or nonmeat protein sources consumed for 4 weeks
- ❑ **LDL-c and ApoB were higher with red and white meat** than with nonmeat independent of saturated FA content
- ❑ No significant difference between red and white meat
- ❑ NO evidence for choosing white > red meat for CVD prevention!!!

What is a plant based diet?

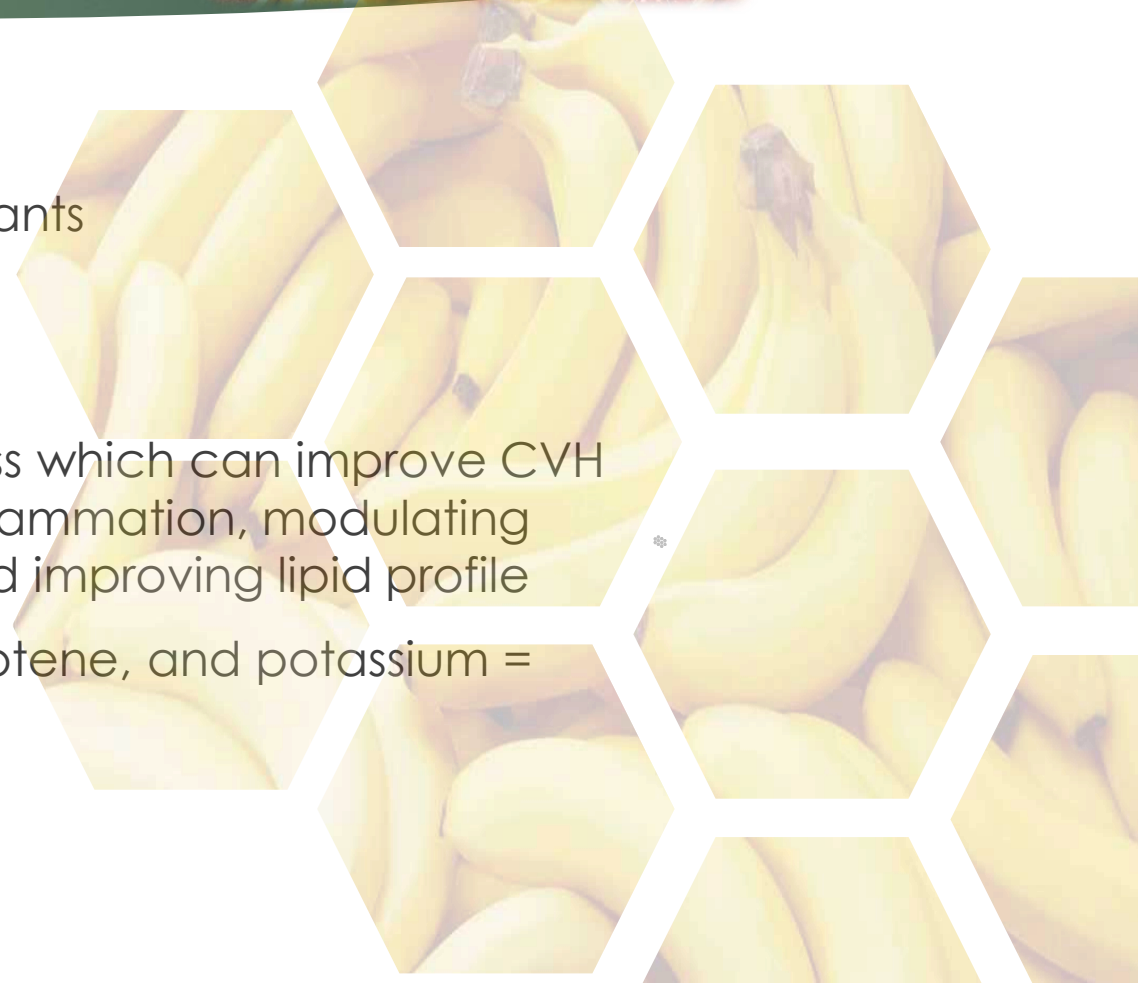
- ❑ Fruits
- ❑ Vegetables
- ❑ Legumes (beans, lentils, and peas)
- ❑ Tofu/tempeh
- ❑ Whole grains
- ❑ Yams
- ❑ Nuts/seeds
- ❑ Plant oils (ie EVOO)
- ❑ Minimal processed plant based foods



Polyphenols



- ❑ Plant foods are rich in polyphenols
- ❑ Natural bioactive compounds produced by plants
- ❑ 4 major classes
 - ❑ Flavonoids, lignans, phenolic acid, and stilbenes
- ❑ Anti-oxidants, protective against oxidative stress which can improve CVH by reducing platelet aggregation, vascular inflammation, modulating apoptotic processes, limiting LDL oxidation, and improving lipid profile
- ❑ Plant based diet high in vitamin C, E, beta-carotene, and potassium = reduces blood pressure and lowers stroke risk



Plant-Based Diets

- Wide diversity of plant-based diets
 - Study looked at healthful plant-based index which positively weights plant foods, and negatively weights less healthy foods



HEALTHFUL PLANT-BASED DIET

Low energy-density
Low saturated fat, high fiber content

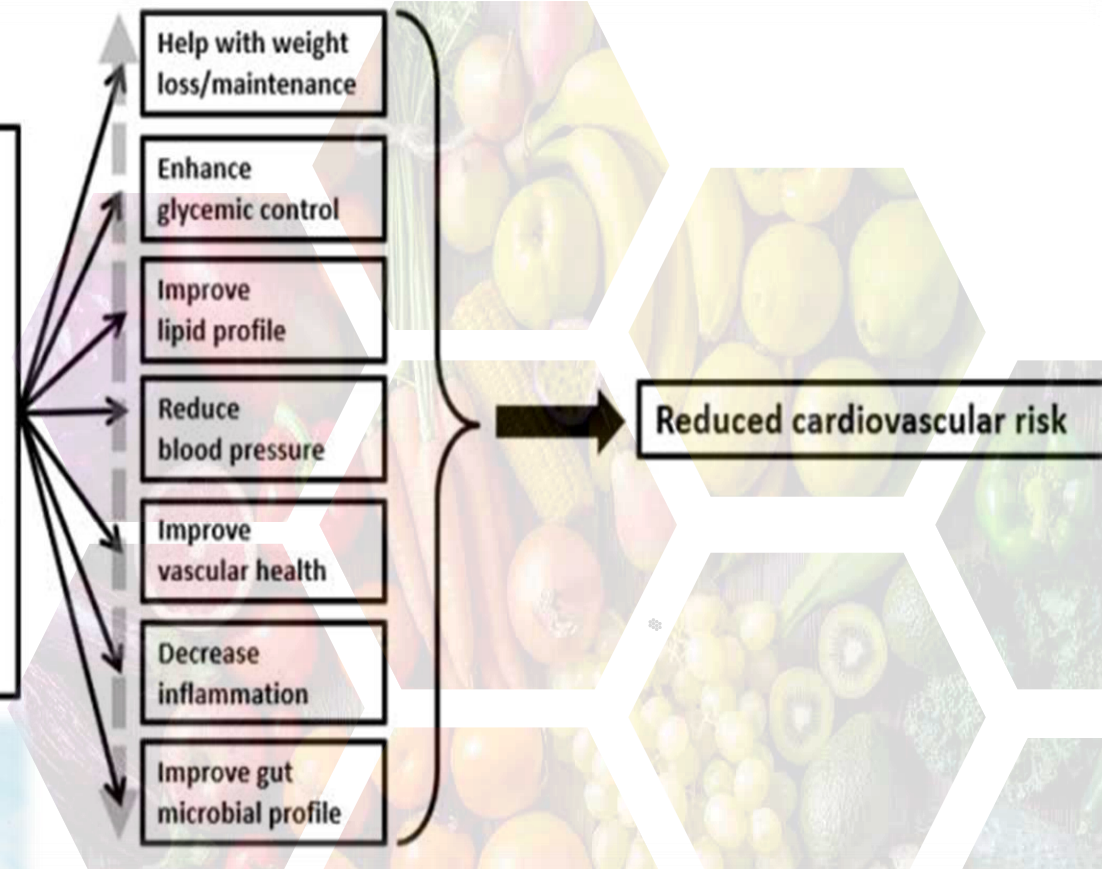
High dietary fiber
Especially cereal fiber

Appropriate fat composition
Low saturated fat, high unsaturated fat

High levels of antioxidant nutrients
Polyphenols, carotenoids, Vitamins C & E

High levels of certain micronutrients
B-vitamins, Magnesium, Potassium

Low levels of certain dietary factors
Heme iron, nitrates, nitrites

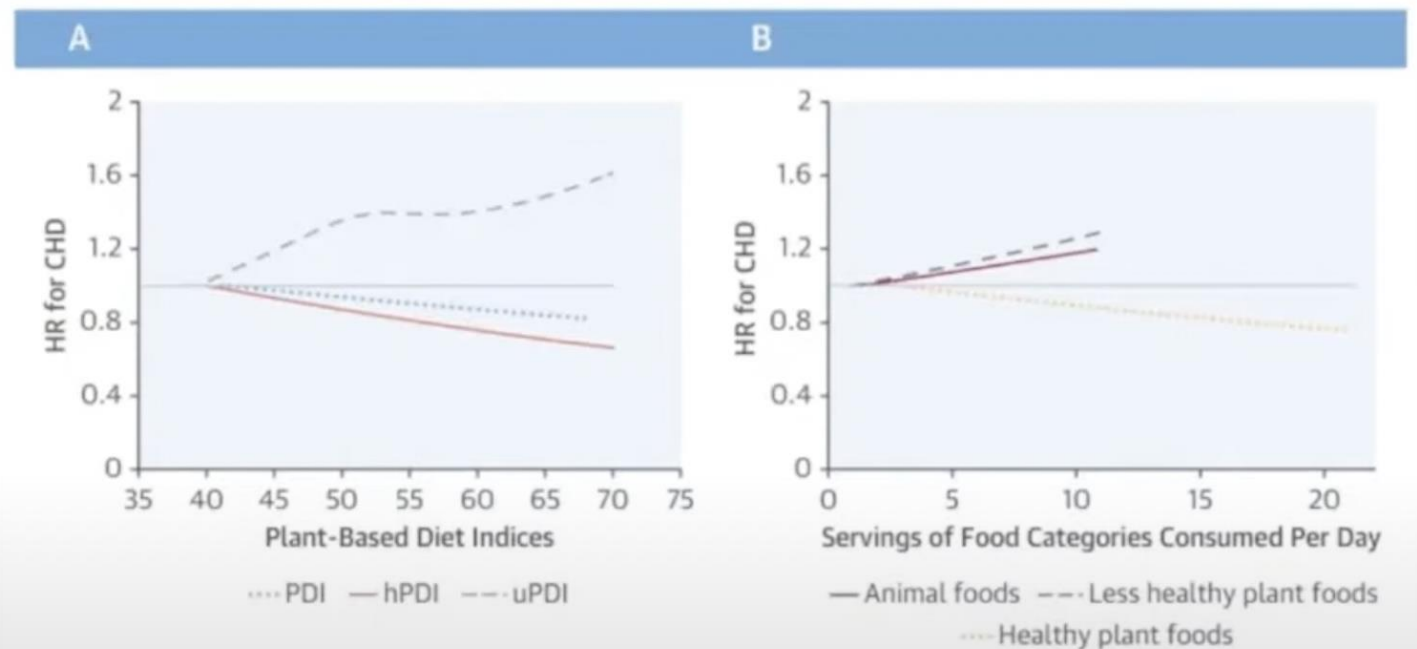


Key nutrients on a plant-based diet

- ❑ **Iron, zinc, iodine, calcium** → nutrient deficiencies do not occur more in plant-based diets compared to other diets
- ❑ **Vitamin B-12** → found in fortified foods although **supplementation is recommended** especially in patients taking metformin
- ❑ **Protein** → consuming more animal protein may increase risk for type 2 diabetes compared to vegetable protein sources → legumes, whole grains, tofu, tempeh, pea protein, nuts and seeds.
- ❑ **Omega-3 fatty acids** → found in seeds (hemp, chia, flax), walnuts, leafy green, vegetables, microalgae, soybeans → lower in omega-6 FA → more ideal ratio to omega-3 fatty acids

Healthy vs. Unhealthy plant based diets

CENTRAL ILLUSTRATION: Dose-Response Relationship of Plant-Based Diet Indices and Animal, Healthy Plant, and Less Healthy Plant Foods With CHD Incidence



Satija, A. et al. J Am Coll Cardiol. 2017;70(4):411-22.

Pathophysiology

- ❑ Diet with whole grains, vegetables, fiber, fruit, and non-hydrogenated vegetable oils. This diet improves cardiovascular health by
 - ❑ Low in energy density d/t low saturated fat and high fiber content
 - ❑ High fiber content = weight loss management = gastric distension triggering satiety and delayed gastric emptying, prolonged nutrient absorption promoting satiety
 - ❑ Meta analysis of RCT found 2-10 g/day increase in soluble fiber decreased LDL cholesterol likely d/t lower cholesterol, fat absorption, altered cholesterol synthesis, increased bile acid synthesis and decreased bile acid absorption

Comparing effectiveness of plant based diets

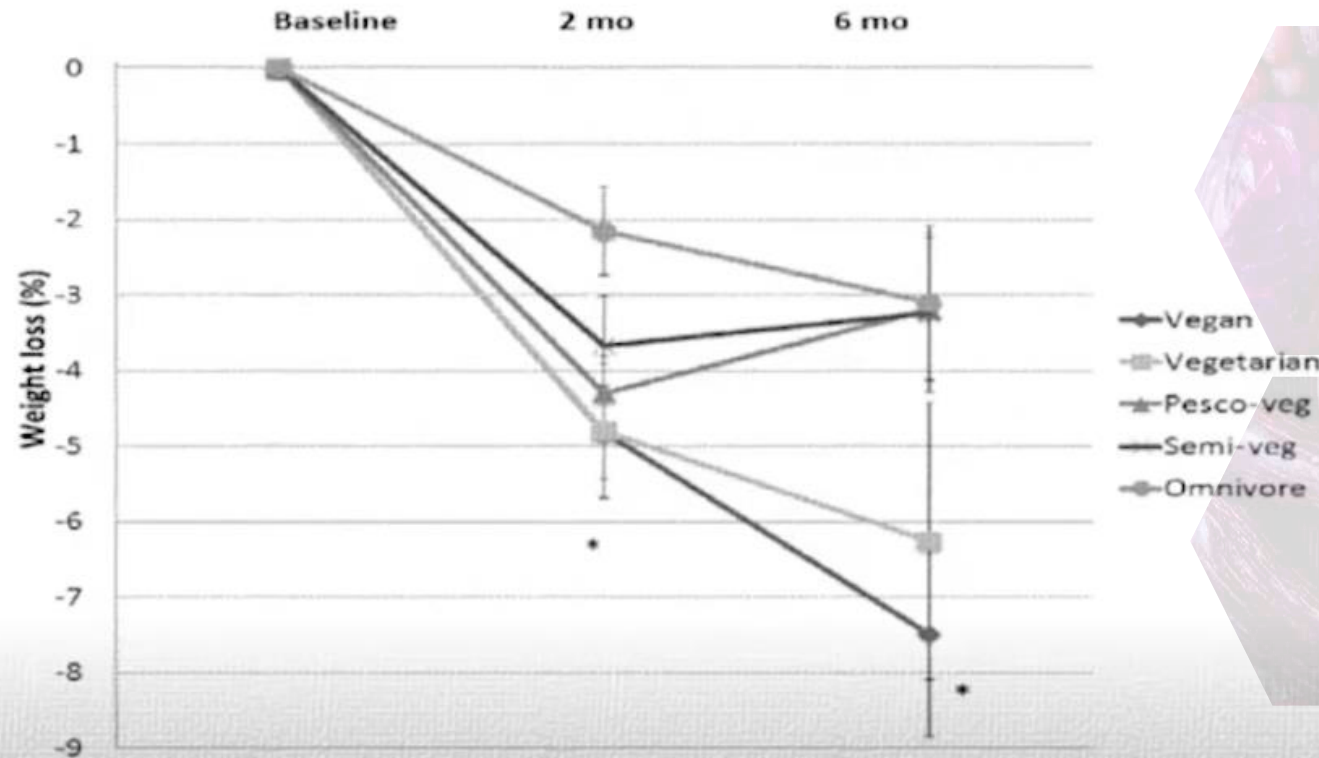
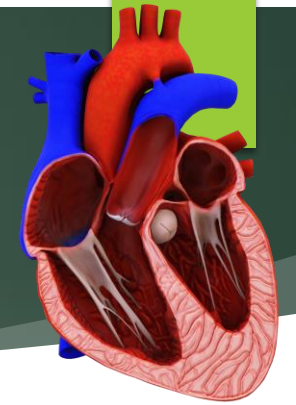


Fig. 2. Percent weight loss (\pm SE) during 6-mo New DIET's trial by diet group. New DIET, New Dietary Interventions to Enhance the Treatments. * P trend < 0.01.

Hypertension



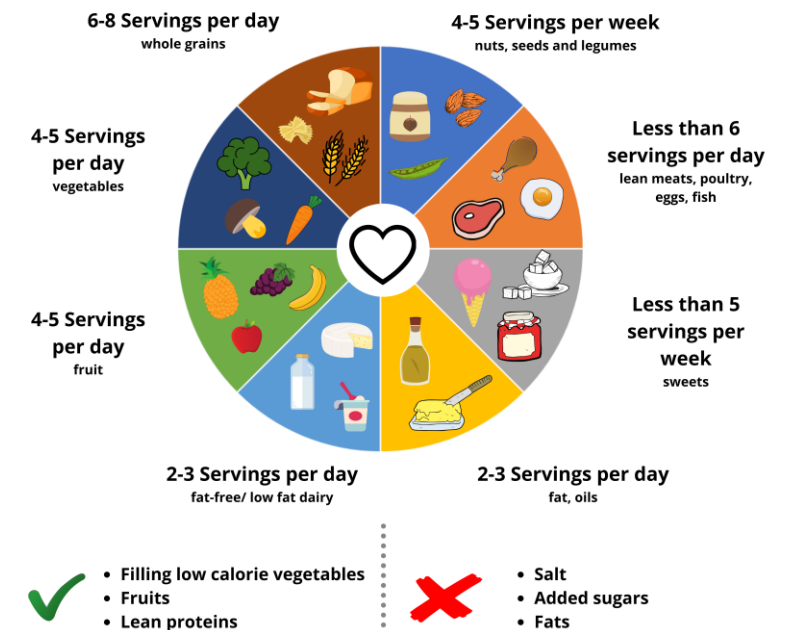
- Plant based diet or plant predominant diet such as DASH or vegetarian diet, may lower both systolic and diastolic BP by:

- Favorably modifying RASS and sympathetic nervous system
- Greater potassium and decreased sodium consumption
- Improved blood vessel dilatation
- Changes in baroreceptors

□ Diet approach to stop hypertension (DASH) diet

- In trial participants with a baseline SBP >150 mmHg
- 11.4 mm Hg reduction in BP
- DASH- low NA: 20.8 mmHg reduction in BP

DASH DIET



Am J Clin Nutr 2005; 81:380-7. Public Health Nutr. 2002. Oct;5 (5):645-54. am J Nutr 2005; 82: 1169-1177. J Nutr 130: 1591-1596, 2000.

Type 2 diabetes mellitus



- ❑ Plant based diets improve glycemic control and body weight
- ❑ Improved nerve function in patients with diabetic neuropathy
- ❑ Highly motivating for patients due to improvements in glycemic control. Weight loss and enhanced quality of life.
- ❑ Vegan and vegetarian diets are nutritionally adequate and may provide health benefits for the prevention and treatment of type 2 diabetes mellitus with the exception of b-12
- ❑ Metformin increases further risk for b12 deficiency --> supplement!

How do I go plant-based?

- ❑ Assess patients readiness for change
- ❑ Don't know where to begin? → [recipes.heart.org](https://www.heart.org) → select vegetarian options!
- ❑ www.nutrition.va.gov → grocery list (vegetables, beans/legumes, fruit, whole grains, nuts/seeds, protein source, healthy snacks)
- ❑ Refer to a registered dietitian if possible!
 - ❑ Eatright.org to find a local RD
 - ❑ Nutrimey.com for teledietetics
- ❑ Financial stress? Frozen vegetables/fruits provide the same nutrient content as fresh vegetables/fruits

Prevention starts today!

- ❑ Nutrition
- ❑ Exercise
- ❑ Stress reduction
- ❑ Psychosocial relationships

