Meat as a Risk Factor for Type 2 Diabetes

Susan Levin, M.S., R.D., C.S.S.D.
American Diabetes Association

Risk factors for overweight adults

- Physical inactivity
- First-degree relative with diabetes
- High-risk race/ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander)
- Women who delivered a baby weighing > 9 lb or were diagnosed with GDM
- Hypertension (blood pressure ≥ 140/90 mmHg or on therapy for HTN)
- HDL cholesterol level < 35 mg/dL (0.90 mmol/L) and/or a TG level > 250 mg/dL (2.82 mmol/L)
- Women with polycystic ovarian syndrome
- A1C ≥ 5.7%, impaired glucose tolerance, or impaired fasting glucose on previous testing
- Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
- History of CVD
- **Meat eater?**

Commentary

Meat Consumption as a Risk Factor for Type 2 Diabetes

Neal Barnard ¹, Susan Levin ², and Caroline Trapp ²
Measuring Meat Consumption

- Categorical – meat vs. no meat
- Gradations
  - Scalar
  - Dietary patterns
Categorical Variable

Seventh-day Adventists (SDA)
• Avoid alcohol, tobacco, caffeine
• Half vegetarian, half omnivores
• Three studies
Adventist Mortality Study

• ~25,000
  – 40% increased risk for meat-eating women
  – 80% increased risk for meat-eating men

Adventist Health Study

- ~34,000
  - 93% increased risk for meat-eating women
  - 97% increased risk for meat-eating men

Adventist Health Study-2

• ~61,000
  – 2x the risk for meat-eaters

Gradations

- Scalar
- Dietary Patterns
Meta-analysis

• ~440,000 participants
  – 100 grams of red meat (3.5 oz) → 19% increased risk
  – 50 grams processed meat → 51% increased risk

Nurses’ Health Study I

• ~70,000
  – Western dietary pattern
    • 49% increased risk of developing diabetes during 14 years follow-up, compared with lowest quintile
    • Isolating products showed 26% increase risk for each serving of red meat added and 38% for each serving of processed meat
  – Prudent dietary pattern

Nurses’ Health Study II

• ~91,000

• Processed meat $\geq 5$ x/week $\rightarrow 91\%$ increased risk
  • Adjusting for other products in pattern did not change this finding

• Red meat $\geq 5$ x/week $\rightarrow 59\%$ increased risk

EPIC-InterAct Study

• ~ 16,000
• Animal protein
• People who ate the most → 22 percent more likely to develop diabetes
• Each additional 10 grams of protein, the risk for DM went up by 6 percent.

Conclusion

While a Western dietary pattern is associated with diabetes risk, meat consumption increases diabetes risk independently of dietary pattern.
What About Fish?

• ~195,000
  – Nurses’ Health Study I and II, Health Professionals Follow-up Study
  – Fish ≥5 x/week → 22% increased risk for developing DM during 14-18 year follow-up, compared with fish < 1/month

• ~20,000
  – EPIC and Multiethnic Cohort Study
  – Fish consumption higher in those with DM

Mechanisms of Action

- Body weight
- Inflammation
- Visceral fat
- Nitrates
- Intracellular lipid
- Iron
- Diabetes
Body Weight

• Observational studies show meat eaters are heavier
• High-fat diet
• Low-fiber diet
• Possible association between animal protein and weight
  – Insulin resistance aggravated by certain amino acids and fat?
  – SFA in meat increase insulin response which reduces fat oxidation?

Visceral Fat

• Eliminating fat may reduce visceral fat and improve insulin sensitivity, compared with conventional diabetes diet.

• ↑ visceral fat → ↑ insulin resistance


Intracellular Lipid

- IMCL aggravates insulin resistance
- Heart of the problem and solution
- Avoiding animal products $\rightarrow$ ↓ IMCL

Iron

- Pro-oxidation damages tissues
- Associated with insulin resistance
- Reductions associated with increased sensitivity

Nitrates

Preservatives may explain increased risk often seen with processed meat products specifically.

Inflammation

• Meat-based diets positively associated with biomarkers of inflammation
• Plant-based inversely associated with biomarkers of inflammation

Common Nutrition Questions

- Protein
- B12
- Iron
- Omega-3
Protein

Of the approximately 20 different amino acids used by the body, nine (essential amino acids) cannot be synthesized by the body and must be obtained from the diet.
Protein

• It is easy to meet protein needs without meat.

• Amino acids that are low in some plants are high in others – usually reflected in traditional meals such as beans and rice.
  – Grains are low in lysine while beans are high in lysine.

• Complementary proteins do not need to be consumed at the same meal.

Protein Sources

- Legumes = 15 grams/cup
- Tofu = 20 grams/cup
- Brown rice = 5 grams/cup
- White rice = 4.25 grams/cup
- White-flour spaghetti = 8.1 grams/cup
- Quinoa = 8.4 grams/cup
- Soymilk = 7.1 grams/cup
- Broccoli = 2.6 grams/cup

Vitamin B12 (Cobalamin)
Produced by microorganisms – plants and animals cannot synthesize B12.
Vitamin B12

- Needs are small – 2.4 micrograms per day.
- Ability to absorb B12 decreases with age because of a decrease in intrinsic factor in the gut. Anyone over the age of 50 should supplement with B12.
- Reliable sources include supplemented foods and supplements.
- Only supplement someone following a plant-based diet needs to take.
• Iron is only lost through bleeding, although very small amounts are excreted through feces, sweat, and exfoliation.
• Men and post-menopausal women should never take an iron supplement.
Iron

• Vegetarians tend to consume more iron than their meat-eating counterparts.
• Non-heme regulation vs. heme
• Non-heme iron is sensitive to enhancers and blockers
  – Blockers: phytates, calcium, polyphenolics
  – Enhancers: vitamin C and other organic acids, soaking
• Although vegetarian adults have lower iron stores than nonvegetarians, anemia does not afflict vegans any more than meat eaters. In addition, there may be some benefits to having low iron stores.

Iron Sources

Grains -
- Bran flakes (1 cup) 10.5 mg
- Oatmeal (packet) 8.2 mg
- Brown rice (1/2 cup cooked) 0.4 mg

Vegetables (1/2 cup cooked) -
- Spinach 3.2 mg
- Swiss chard 2.0 mg
- Pumpkin 1.7 mg
- Kombu (8 g dry or < 2 TBS) 22.1 mg
- Nori (8 g dry or < 2 TBS) 3.7 mg

Iron Sources

**Fruits** –
- Prunes (1/4 cup) 1.2 mg
- Apricots, dried (1/4 cup) 0.9 mg

**Legumes** (1/2 cup cooked) –
- Black-eyed peas 2.2 mg
- Garbanzo beans 2.4 mg
- Lentils 3.3 mg

**Soyfoods** -
- Soybeans (1/2 cup cooked) 4.4 mg
- Tofu, firm (1/2 cup) 6.6 mg

**Other** -
- Blackstrap molasses (1 Tbsp) 3.6 mg
- Pumpkin seeds (2 Tbsp) 2.5 mg
Omega-3

- There are two essential fatty acids: omega-6 and omega-3.
- ALA, an 18-carbon omega-3 fatty acid, is converted to eicosapentaenoic acid (EPA) which, in turn, can be elongated to docosahexaenoic acid (DHA).
Omega-3

- Americans consume tremendous amounts of omega-6s compared to omega-3s.
- Lop-sided ratio makes it difficult for omega-3s to impart their anti-inflammatory effects.
- The AI for omega-3 for men is 1.6 g/d (14 calories) and for women is 1.1 g/d (10 calories).
- Aim for a 4:1 ratio.
- Happens naturally with a low-fat, plant-based diet.
In Summary

Vegetarian diets are often associated with a number of health advantages, including lower blood cholesterol levels, lower risk of heart disease, lower blood pressure levels, and lower risk of hypertension and type 2 diabetes.

- The Academy of Nutrition and Dietetics

Thank You

slevin@pcrm.org