Nutrition and MS: An update

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MS and Disability (Natural history)

• **Fifteen years after diagnosis**
  – ~80% of patients with MS have some functional limitation
  – ~50% to 60% require assistance when ambulating
  – ~70% - limited or unable to perform major activities of daily living
  – ~75% - not employed
Common Comorbidities in MS can affect disease course or activity

- Emerging data suggests non-MS related health problems may make MS worse
  - Vascular disease risk factors appear to accelerate disease
  - Obese children more likely to get MS
  - Smoking
  - Vitamin D Deficiency

- Modern life style may be increasing the risk of developing MS
Comorbidities and effect on hospitalization in MS

- Two-fold higher all-cause hospitalization rate in MS patients with one or more comorbidities than without any comorbidity

Comorbidities and effect on mortality in MS

- **Study:** 5,797 MS vs. 28,807 matched controls
- **Compared causes of death between populations**
- **Median survival from birth:**
  - MS - 75.9 yrs vs 83.4 yrs matched population
- **MS was associated with a 2-fold increased risk of death**
- **Comorbidities associated with increased hazard of death in both populations, included diabetes, ischemic heart disease, depression, anxiety, and chronic lung disease**

MS Disability and Vascular Comorbidities

- **Vascular co-morbidity - > 50%**
  - Hypercholesterolemia – 37%
  - Hypertension -30%
  - Heart disease - 7%
  - Diabetes – 6%
  - Peripheral Vascular Disease – 2%

- **16% had 2 vascular co-morbidity; 4% had 3**

Marrie R et al. Neurology 2010;74:1041-1047
Vascular Risk Factors Increase Risk of MS Disability

Marrie R et al. Neurology 2010;74:1041-1047
Vascular Risk Factors Increase Risk of MS Disability

- More than 50% of NARCOMS survey responders had at least one vascular comorbidity at the time of their MS diagnosis.
- A dose-response relationship between VDRF and MS disability with presence of a single VDRF increasing the risk of early gait disability by 51% and presence of 2 of these conditions increasing the risk to 228%.
Figure. Trends in adult overweight, obesity, and extreme obesity among men and women aged 20–74: United States, selected years 1960–1962 through 2011–2012

NOTES: Age-adjusted by the direct method to the year 2000 U.S. Census Bureau estimates using age groups 20–39, 40–59, and 60–74. Pregnant females were excluded. Overweight is body mass index (BMI) of 25 or greater but less than 30; obesity is BMI greater than or equal to 30; and extreme obesity is BMI greater than or equal to 40.

BMI Linked to Risk of MS Progression in Observational Study

• 5 year follow up, 150 people with MS
• Retrospective study
• Associations between body weight, MRI, and disability (EDSS)
• Overweight and obese patients - more likely to show a significant progression of MS disease markers or symptoms than people with normal weight

Zacharia et al, June 2015, CMSC annual meeting abstract
Lipid profile and MRI lesion formation in MS

- Lipid profiles are associated with lesion formation over 24 months
- 135 CIS pts (≥2 brain MRI lesions and ≥2 oligoclonal bands)
- Higher LDL-C and Total cholesterol levels - increased cumulative number of new T2 lesions over 2 years
- Higher TC was associated as a trend with lower baseline whole brain volume (p=0.020)
Lipids, Statins and MS

• Adverse lipid profile associated with high levels of MS disability and disease progression
• Statin use not beneficial on clinical outcomes in MS

Diet and MS - Background

• Dr Swank’s work at Montreal Neurological Institute

• 1948-1950 performed studies on prevalence of MS in Norway and its relationship with diet
  – MS much less common in coastal regions vs inland; inland population ate diet much higher in animal fats

• 1950 started patients on a diet with 10-15 gm of saturated fats with protein from seafood and skim milk
Diet and MS: Background

“Good dieters” (n=70)
– Followed a low-fat diet (Consuming less than 20 g/d of sat. fat)
• 34 years later: 23 deaths
• In year 2000: 15 survivors
• 13 /15 were still ambulatory and otherwise healthy

“Bad dieters” (n=74)
– Consumed more than 20 g/d of sat. fat
• 34 years later: 58 deaths
• In year 2000: no survivors

A Randomized-Controlled Study of Diet & Multiple Sclerosis

- 61 people with MS participated
- Wait-list control group (N=29) vs. low fat, plant based diet (N=32)
- Trained in McDougall Diet and followed diet for one year

Yadav et al, Effects of a Low Fat Plant Based Diet in Multiple Sclerosis (MS): Results of a 1-Year Long Randomized Controlled (RC) Study. P6.152. AAN 2014 Annual Meeting, Philadelphia, USA

Diet Compliance

![Graph showing diet compliance over time with error bars for control and low-fat diet groups.]

<table>
<thead>
<tr>
<th>Time (months)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tr>
<td><strong>Control</strong></td>
<td>29</td>
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<td>27</td>
<td>29</td>
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<td>29</td>
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<td>27</td>
<td>27</td>
</tr>
<tr>
<td><strong>Low-fat diet</strong></td>
<td>32</td>
<td>31</td>
<td>29</td>
<td>30</td>
<td>28</td>
<td>29</td>
<td>28</td>
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<td>28</td>
<td>26</td>
<td>26</td>
<td>25</td>
<td>26</td>
</tr>
</tbody>
</table>
Changes in body mass index during 1-year trial

Yadav et al, Effects of a Low Fat Plant Based Diet in Multiple Sclerosis (MS): Results of a 1-Year Long Randomized Controlled (RC) Study. P6.152. AAN 2014 Annual Meeting, Philadelphia, USA

Changes in blood lipids during 1-year trial

Yadav et al, Effects of a Low Fat Plant Based Diet in Multiple Sclerosis (MS): Results of a 1-Year Long Randomized Controlled (RC) Study. P6.152. AAN 2014 Annual Meeting, Philadelphia, USA

Improved fatigue in diet group

Yadav et al, Effects of a Low Fat Plant Based Diet in Multiple Sclerosis (MS): Results of a 1-Year Long Randomized Controlled (RC) Study. P6.152. AAN 2014 Annual Meeting, Philadelphia, USA

<table>
<thead>
<tr>
<th>Diet Type</th>
<th>Fruits</th>
<th>Vegetables</th>
<th>Grains</th>
<th>Proteins</th>
<th>Dairy</th>
<th>Oils</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Swank Diet</strong></td>
<td>Yes</td>
<td>Yes <em>Limit avocado, olives</em></td>
<td>No crackers, baked goods with fat</td>
<td>Limit portion size of poultry, fish, lean means</td>
<td>Non-fat dairy</td>
<td>No solid fats; <em>Limit daily intake of fats</em></td>
</tr>
<tr>
<td><strong>Plant-based (e.g. McDougall)</strong></td>
<td>Yes</td>
<td>Starch-based + other brightly colored vegetables</td>
<td>Whole grains, unrefined flour, egg-free pasta</td>
<td>Beans, peas, legumes <em>No animal protein sources</em></td>
<td>No</td>
<td>No added fats; no nuts/seeds</td>
</tr>
<tr>
<td><strong>High-protein (e.g. Paleo)</strong></td>
<td>Fresh fruit; Avoid high sugar juices <em>No processed fruits</em></td>
<td>Fresh vegetables; No starchy vegetables <em>No processed vegetables</em></td>
<td>No grains or cereals</td>
<td>Grass-produced meats, fish/seafood, eggs, nuts, seeds <em>No legumes</em></td>
<td>No</td>
<td>Olive, walnut, flaxseed, coconut <em>No processed oils</em></td>
</tr>
<tr>
<td><strong>Anti-inflammatory</strong></td>
<td>Fruits with lower glycemic load</td>
<td>Brightly colored preferred; Antioxidant-rich herbs and spices</td>
<td>Whole &amp; cracked grains, pasta</td>
<td>Fish/Seafood <em>Limit animal protein: Eggs, poultry, lean meat</em></td>
<td>Natural cheese/yogurt <em>Limited to 1-2x’s/wk</em></td>
<td>Healthy fats; nuts, seeds</td>
</tr>
<tr>
<td><strong>Gluten-Free</strong></td>
<td></td>
<td>No barley, wheat, rye</td>
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Proposed Pro-inflammatory Dietary Factors

- Saturated fatty acids of animal origin
- Unsaturated fatty acids in the trans configuration (hydrogenated fatty acids)
- Red meat
- Sweetened drinks, and in general hypercaloric diets rich in refined (low-fiber) carbohydrates, in addition to animal fat
- Increased dietary salt intake
- Cow’s milk proteins of the milk fat globule membrane (MFGM proteins)
Polyphenols

- Present in vegetables, cereals, legumes, spices, herbs, fruits, wine, fruit juices, tea, and coffee
- Anti-inflammatory, immune-modulatory, anti-angiogenic, and antiviral properties
- Include flavonoids and non-flavonoids molecules
Polyphenols

• Most important flavonoids: quercetin (onions, apples, citrus fruit, and wine), catechins (green tea)

• Most important nonflavonoids: resveratrol (chocolate, peanuts, berries, black grapes, and red wine), curcumin (spice turmeric of ginger family, curry), and hydroxytyrosol (olive oil)
Vitamin D and MS

• High serum vitamin D levels associated with a decreased risk of developing MS among Caucasians
  – Munger et al, JAMA 2006; 20:2832-8

• Low serum vitamin D levels appear to be associated with increase risk of having relapses
  – Studies suggest that for each 10 nmol/l increase in vitamin D level there is a 12% reduction in risk of having relapse

Simpson et al Ann Neurol 2010; 68:193-203
Osteoporosis is more prevalent in MS than general population

- 27.2% (2,501/9,029) reported low bone mass and 15.4% reported osteoporosis
- Data from a large MS center found that 80% of males with MS evaluated with DXA scan had reduced bone mass at the lumbar spine or femoral neck
- Reduced bone mass also translated into increased fracture rates as was shown by Cosman et al. In this study, 22% of patients with MS suffered fractures as compared with only 2% of age-matched controls

Marrie et al. conducted a study using North American Research Committee on Multiple Sclerosis (NARCOMS) data
Risk Factors for Osteoporosis

**Congenital Factors**
- Age
- Family history
- Chronic Disease
- Caucasian Race
- Female Gender

**Acquired Factors**
- Visual Impairment
- Dementia
- Low Body Weight
- Recurrent Falls
- Early menopause
- Hypothyroidism & Hyperthyroidism

**Lifestyle**
- Low Ca
- Alcoholism
- Vitamin D deficiency
- Inactivity
- Smoker

**Iatrogenic Factors**
- Glucocorticoids
- Cyclosporine
- Anticonvulsant
- Thyroxin
- Aluminum
- GnRH agonist
- Lithium
- Aromatase inhibitor
What should be done?

- Wide range in disease course severity and the risk of malnutrition among MS patients
- Registered dietitians working with MS patients should review the signs and symptoms obtained in the nutrition assessment and diagnose nutrition problems based on these signs and symptoms
- Consider - Weight and weight history - when malnutrition is suspected
What can be done?

• Common problems that may be modified by nutrition care: dysphagia and constipation

• Attention to MS
  – Patient's appetite
  – Ability to eat with or without assistance
  – Arrangements regarding food shopping and cooking

• Supportive nutrition education tailored to the individual can help a MS person meet nutritional needs and regain some feeling of control in his or her life
What can be done now?

- **Vascular disease risk factor reduction**
  - Diet and lifestyle interventions

- **Obesity – optimal BMI**
  - Fatigue improvement and weight reduction

- **Vit D – optimal dosing**

- **Bone health**

- **Exercise and its benefits**
Thank You