

Nutrition and Myositis: What we know (and still need to learn)

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Talk Outline

- Eating healthy in general
- Nutritional abnormalities in chronic disease
- Specific supplements and diets related to myositis

“It’s not rocket science”

- Eat healthy foods
- Eat moderate portion sizes
- Eat a varied diet
- Enjoy your meals
- Involve yourself in meal preparation

We are so much more than our myositis

- We are what we are “thanks to” our genes and our environment
- We unfortunately can also get:
 - Diabetes
 - Heart disease
 - Cancer
 - Alzheimer’s
- But...we do have control over some things

Anti-oxidants

- Protect the body from harmful free radicals, important especially in heart disease and cancer
- Include vitamins, such as A, C, E, and minerals, e.g. selenium, and CoQ10
- Major sources are berries, beans, artichokes, nuts, herbs and spices
- Supplements are probably not as effective as whole foods and may even be harmful

Eat Your Veggies (and Fruits) *BUT...*

Balance - Overeating of one type can result in mineral binding

- Oxalates (cocoa and spinach)
- Phytates (legumes and whole grains)
- Tannins (tea, beans, and cabbage)

Corn and white potatoes have a high-glycemic index.

Be sure they are prepared in a healthy manner.

Fruit: “One is a serving; two or more is dessert.”

Juice: How many apples or oranges would you eat?
(calories)

Carbohydrates: Our love-hate relationship

- Think of these foods as “CARBAGE”
- Sugar really can be addictive; eliminating it causes decreased desire
- Learn to lower your glycemic load
- Avoid all processed foods
- “Fight the white”: Grains should be whole-grain, such as bulgur wheat, brown rice, quinoa

Carbohydrates: Our love-hate relationship

- NO high-fructose corn syrup (HFCS)!!
 - Long-term effects similar to alcohol due to its metabolism by the liver
 - May increase one's risk of nonalcoholic fatty liver disease (NAFLD).
- Avoid soda:
 - Sugary ones have the HFCS
 - But artificial sweeteners in diet sodas change the gut microbiome
 - Both contain phosphoric acid (bad for bones!)

And then there are the fats...

- Our society has an imbalance of omega-6 and omega-3 fatty acids, also called PUFAs (polyunsaturated fatty acids)
- Major factor responsible for obesity epidemic and heart disease
- Omega-3 = anti-inflammatory
- Omega-6 (in excess) = pro-inflammatory
- Early human diet was a 1:1 (equal) ratio of 6 and 3 PUFAs; now it is 10:1-15:1 or higher (way too much PUFA-6)

Fatty Acids: *Omega-3*

- Alpha-linolenic acid (ALA): flaxseeds and walnuts richest sources as well as canola
- Body converts ALA → EPA → DHA (men less than women, all of us less with age)
- Major sources EPA and DHA: oily fish, enriched eggs
- Supplements: fish oil has EPA and DHA; algal and fungal sources have DHA

Fatty Acids: *Omega-3*

- Can decrease production of inflammatory molecules, including TNF-alpha
- May increase the efficacy of anti-TNF-alpha therapy
- Eating oily (wild-caught) fish 1-3 times a week may be enough
- Fish or krill oil (distilled) 2-3 grams per day as supplement as alternative
- Avoid if on blood thinners, upcoming surgery

Fatty Acids: *Omega-6*

- Food sources: linoleic acid (LA)
 - Safflower, sunflower, grapeseed, soy, corn
- Supplements: gammalinolenic acid (GLA)
 - Considered an **anti**-inflammatory agent; possibly helpful for autoimmune disorders
 - Borage, black currant, & evening primrose oils
 - Choose borage oil without *pyrrolizidine alkaloids*, which may damage the liver; also use with caution if on blood thinners

Fatty Acids: *Omega-7*, Conjugated linoleic acids (CLA)

- Made by gut bacteria in ruminant* animals; grass-fed have 300-500% more CLA than grain-fed (*sheep, goats, cows, kangaroo)
 - Anti-cancer (except HER2+ breast cancer)
 - Anti-RA/lupus
 - Anti-abdominal fat deposits
 - Promote muscle growth
 - Oppose stress-induced cortisol
- [Caution if overweight: may cause insulin resistance]

What fats are good to eat?

Cooking oils

- Olive (use regular version; save pricier extra-virgin for dressings, dipping)
- Walnut
- Flaxseed
- Expeller-pressed organic canola, sunflower or safflower
- Avocado
- Coconut (medium chain saturated fat)

What fats are good to eat?

Food sources

- Fatty fish (salmon, sardines, herring)
- Pasture-fed beef and pork
- Omega-3 fortified eggs
- Hemp, chia seeds and flaxseeds
- Nuts, especially walnuts, cashews, almonds
- And....a weed??

Purslane

- You probably have this weed in your yard
- More omega-3 fatty acids (ALA) than any other leafy plant
- Can be eaten raw, stir-fried, in soups
- Use as you would spinach



What fats not to eat?

- Simple: Avoid any partially hydrogenated fats
- Avoid corn, cottonseed, vegetable, palm kernel, safflower* and sunflower* oils
- Avoid fried foods: potential for *trans*-fats or toxic compounds with high heat

*unless expeller-pressed, organic

How Much Protein?

- No clear that protein intake will reverse myositis or muscle loss, but it is still needed!
- Ideal is 0.8-1 gm/kg/day
(0.35-.45 gm/lb/day)
- Example: 150 lb (70 kg) person should have ~55 gm/day of protein
 - Maybe less for women(~45 gm/day)
- Aim for 15-20 gm/meal

How Much Protein?

- Protein grams in food:
 - Egg 7 gm
 - 3 oz serving of meat, poultry, fish ~20 gm
 - Yogurt 6 ounces ~8 gm
 - Cheese 1 ounce ~5 gm
 - Nuts $\frac{1}{2}$ cup ~15 gm
 - Tofu $\frac{1}{2}$ cup 20 gm
 - Beans 1 cup 15 gm

Common Thread for Studies: Muscle Recovery, Strength-Sparing

- Adequate protein intake
- High intake of omega-3 and other anti-oxidants
- Moderate (to high) intake of good fats

Anti-Inflammatory Diet

- Avoid processed foods: eat “whole foods”, the way nature intended it
- Avoid sugar, high-fructose corn syrup
- Highly vegetable-based
- Broth-based soups
- Moderate amounts of lean protein:
 - More fish
 - Less animal protein, except moderate amounts of free-range poultry, grass-fed beef or pork
 - Green, white, oolong tea and $\geq 70\%$ cocoa

Positive Effects of Anti-Inflammatory Diet

- ❖ In a 2007 study, Rose Mary Istre found those with myositis who followed an AID over 12 weeks had improved:
 - ❖ Grip, arm and leg strength measurements
 - ❖ Ease of routine activities
 - ❖ Severity of depression

Salt

- Daily salt intake should be 1200 mg (over 70 years) – 1500 mg (under age 50)
- One McDonald's bacon, egg, cheese biscuit has 1250 mg of salt
- 77% of sodium comes from restaurant and processed foods; the rest:
 - 5% home-cooked
 - 6% added at table
 - 12% naturally-occurring

Salt

- Recent studies found that mouse and human cells cultured in high-salt conditions produced more of the immune T_H17 cells than those grown in normal conditions. *Na Sci Rep.* 2016 Jun 29;6:26767
- Some forms of autoimmunity have been linked to overproduction of T_H17 cells, a type of helper T cell that produces an inflammatory protein called interleukin-17.

Salt

- The popularity of fast food -- laden with up to *100 times* as much salt as similar home-prepared meals -- has accompanied an increase in autoimmune diseases.
- Particularly relevant would be for patients with MS and psoriasis, which both are strongly influenced by TH17
- Salt = sodium chloride; “*fancy*” and sea salts still contain sodium

Body Mass Index Relationship to Disease and Medication Effects

- Increased BMI is associated with increased inflammation due to the effect of adipose (fat) cells on release of cells and mediators like cytokines
- Psoriasis severity, an autoimmune disease, improves with weight loss *Am J Clin Nutr August 2016 vol. 104; 259-265; others*
- Studies in patients with inflammatory conditions such as asthma and rheumatoid arthritis show **decreased results** from medications, such as steroids, adalimumab, etanercept, and infliximab

Mediators Inflamm. 2014;2014:386148

So remember...

- Eat the rainbow!
 - Include lots of foods - whole and fresh - that are red, orange, green, blue and yellow
- “Fight the white”: Avoid...
 - Added salt and processed foods
 - White sugar (or too much of any kind, really)
 - White potatoes
 - White rice
 - White bread
 - (or maybe all wheat bread....)

Obstacles to Dietary Changes

Potential Problems

- Habits and cultural/religious considerations
- Access to fresh and healthy foods
- Ability to buy, prepare and cook food
- Dysphagia (difficulty swallowing)
- Poor dentition

Potential Solutions

- Registered dietitians can provide nutritional options for special diets
- Occupational/speech therapy
- Grocery delivery and food preparation services and friends
- Regular dental exams

SUPPLEMENTS

Curcumin

- Active ingredient in turmeric (think curry and mustard)
- Inhibits inflammation with interest in cancer, inflammatory disease, Alzheimers
- 2007 study in mice: blunting of CK increase with exercise-induced muscle damage

Davis J. Am J Physiol Integr Physiol 2007;292:R2168

- 2008 study in mice improvement with muscular dystrophy

Pan Y. Mol Cells. 2008;25(4):531

Curcumin

- Seems to accumulate best in colon
- Holds promise for GI-related conditions
- Curcumin is very poorly absorbed
- Doses less than 4 grams per day were not detected in serum in human clinical studies
- New formulations, such as nanoparticles are being investigated to increase its availability

Curcumin

- Need to combine with piperines (black pepper extract) or use ones with augmented features to improve absorption
- May increase bleeding in those taking drugs like coumadin
- Because of its inhibitory effect on COX-1 and COX-2, might increase risk of cardiac disease
- Have a good lipid profile as safeguard

Coenzyme Q10 in statin-induced myopathy

- Reduction in CoQ10 could cause abnormal mitochondrial dysfunction
- Statins lower CoQ10, but most studies have not shown that supplements increase levels
- “The present evidence does not support [CoQ10’s] supplementation in statin-induced myopathy.”

Schaars and Stalenhoef, 2008

Current Opinion in Lipidology

Coenzyme Q10 in statin-induced myopathy

- A small Slovenian study (50 pts) showed decreased muscle pain after 30 days with CoQ10 50 mg twice daily compared with placebo *Med Sci Monit.* 2014 Nov 6;20:2183-8
- A larger study(120 pts) from U Conn showed no improvement in muscle pain, muscle strength or aerobic performance after 8 weeks of 600 mg daily
Atherosclerosis. 2015 Feb;238(2):329-35

And this just in.....

From the European Society of Cardiology Congress in Rome (just ended August 31st, 2016)

- A leading Italian heart disease expert Professor Giovanni de Gaetano, MD PhD, discussed his group's findings:
- Those who ate mainly a Mediterranean-type diet were 37% less likely to die during the study than those who were furthest from this dietary pattern.
- Previously, cholesterol-lowering drugs such as statins were believed to be the most effective method of combating heart disease
- Statins are said to help reduce major heart problems by around 24%.

The problem with CoQ10

- No great data for its use in myositis (IIM)
- As we age, CoQ10's absorption, biosynthesis and conversion to ubiquinol decreases
- Ubiquinol form is better absorbed and probably more effective
- Does it matter? (If it gets into the blood, does it actually increase tissue levels?)

Use of Coenzyme Q10

- Interest in cardiac, neurologic and periodontal diseases
- 150 mg daily of ubiquinol used in studies
- Choose ubiquinol form instead of ubiquinone for better absorption
- Avoid if on coumadin

Vitamin D

- Clearly seems to have a role in *preventing* autoimmune disease (patients with DM/PM, RA, SLE, etc. found deficient)
- Its role in *treatment* less clear
- However, vitamin D supplementation in statin-induced myositis patients reversed symptoms in 87% of 150 patients studied

Glueck C. Current Med Res Opin 2011;27:1683

Vitamin D

- Important to support bone health, mental health, infection control
- Especially important for those avoiding the sun and with dark skin
- Decreased by steroid use
- Blood levels above 30 considered adequate; 40-50 may be ideal; higher levels do not lead to longer life

Vitamin D

- Treatment for deficiency: 2000 IU/day of vitamin D₃ or 50,000 IU weekly vitamin D₂
- Roughly 100 units/day raises vitamin D level by 1 ng/ml (or 1000 U/day raises level by 10); double dose needed for overweight patients
- Recheck level after 6 weeks of supplement

Folate (folic acid or B9)

- Important to take if on *methotrexate* to avoid:
 - Decreased white blood cells, GI symptoms, hair loss, liver and lung toxicity
- Supplement as 1-2 mg daily (Rx)
- Unclear if should avoid on same day as methotrexate (possibly less effective)

Folate (folic acid or B9)

- Folinic acid (leucovorin) is similar in effect but more expensive
- Need adequate vitamin B₁₂ intake:
 - Its deficiency masked by taking folate
 - Good B₁₂ sources: fish/shellfish, beef, eggs, nutritional yeast

Probiotics

- Observed increase in autoimmune disease in those with decrease in beneficial bacteria
- Autoimmunity associated with “leaky gut”, allowing antigens to enter and stimulate the immune system
- Those with altered gut flora have slower metabolism, higher risk for obesity

Probiotics

- In many autoimmune conditions, improving intestinal inflammation improves symptoms
- A normal “*human biome*” or “*microbiota*” is now considered a separate immune organ (maybe up to 80% of immune system);
- Altered by antibiotics and poor diet

Probiotics

- Use of probiotics in mice: improved or prevented RA, MS and type-1 diabetes
- Improvement seen with **periodontitis**
- Dietary sources:
 - Yogurt, kefir or lassi with live cultures
 - Aged cheese
 - Fermented foods (brine-cured, non-vinegar pickles, sauerkraut, kimchi, miso)

Probiotics

- The “jury is still out” on which strains are best for which condition and also if needed indefinitely to maintain effect
- Should have many billions of cultures and include at least Bifidobacterium and lactobacilli (casei, rhamnosus)
- Keeping them refrigerated prolongs effectiveness

Probiotics

- Caution in those with:
 - Severe immune-compromised states
 - Malignancy
 - Central venous catheters
 - Cardiac valve disease
 - Diabetes
- Rare fungal infections reported in those taking Florastor (Probiotic yeast, *Saccharomyces boulardii*)

Whey

- Has been looked into as dietary source of cysteine, needed for glutathione production, an important element in anti-oxidant defense
- Glutathione itself as an oral supplement is not well-absorbed
- This may be helpful for autoimmune disease and myopathies but data is very limited, mostly presumed

Whey

- Typical doses are 20-30 grams daily.
- Very safe: reports of intestinal discomfort and fatigue with high doses
- One case of liver injury in weightlifter also taking a creatine supplement.

Other supplements

- Vitamins C and E: no good data
- L-carnitine: no good data
- Glutamine:
 - Because it inhibits muscle wasting and preserves muscle protein, it may help myotonic muscular dystrophy
 - Can raise methotrexate levels; no good data on myositis

Supplements that may do more harm than good

- Spirulina and blue-green algae
 - At least two patients with DM had a flare or onset of their disease after taking these

Lee A. *Arch Dermatol* 2004;140:723
Konno T. *Rinsho Shinkeigaku* 2011;51:330
- Echinacea (purple coneflower)
 - Has produced flares of lupus, including kidney-related complications

NOTE: Most agree data in this area is sparse.

Diets and supplements with some
evidence regarding myositis

There Is Hope...

Ketogenic Diet

- Similar to Atkins diet (high fat, moderate protein, low carbs)
- Used mainly for children with extreme seizure disorders
- Preliminary data in mice that it may improve muscle performance in Alzheimer's (like IBM, associated with beta-amyloid deposits); also being studied in humans with various neuromuscular diseases

Gluten Sensitivity

- Association of myositis with gluten sensitivity described since at least 1976
- There have been reports of clinical improvement following a gluten-free diet in:
 - **PM:** *Lancet* 1976;2:317; *Clin Rheumatol* 1984;3:533-9; *J Rheumatol* 1996;23:782-3.
 - **DM/JDM:** *J Pediatr Gastroenterol Nutr* 1997;25:101-3; *J Rheumatol* 1999;26:1419-20; *Clin Exp Rheumatol* 2001;19:201-319, 757-8; *Can J Gastroenterol* 2006;20(6):433-435.
 - **IBM:** *Muscle Nerve*. 2005 Feb;31(2):260-5, 2007 Jan;35(1):49-54, 2007 Apr;35(4):443-50.

Gluten Sensitivity

- Not all patients will have positive antibodies (anti-glutaminase/gliadin/ endomysial, etc.)
- Symptoms can range from none to:
 - Weight loss
 - Abdominal cramping
 - Bloating
 - Loose stools
 - Anemia
 - Evidence of bone loss
 - Vitamin E deficiency

Gluten sensitivity: Substitutions

- Brown rice
- Quinoa
- Buckwheat
- Amaranth
- Sorghum
- Millet
- Teff
- Tapioca

Many available as breads, pasta, cereals and flours

Creatine: Definitions and Clarifications

- Creatinine:
 - Metabolized end-product of creatine, found in blood, muscle and urine;
 - Measured to assess kidney function
- Creatine kinase (CK) or creatine phosphokinase (CPK):
 - Muscle enzyme involved in energy production;
 - Measured to assess skeletal muscle inflammation or damage, as well as in brain and heart muscle

Supplements: Creatine

- Taken as a daily *supplement* to improve muscle strength and/or mass
- A 2013 *Cochrane Database Systematic Review* deemed it a *worthwhile supplement* with few side effects for those with DM and PM
- Most data was taken from a 2007 study done in the UK and Sweden where creatine was combined with exercise (Dr. Ingrid Lundberg was a co-author)

Chung et al. *Arthr Rheum* 2007;57:694-702

Supplements: Creatine

- Dosage used in the 2007 study:
 - Start with 20 grams per day for 8 days (loading dose)
 - Continue with 3 grams per day (maintenance dose)
- Noted improved performance, ability to undertake high-intensity exercise and endurance work
- Effect maintained over 5 months

Supplements: Creatine

- Safety: there were no side effects noted
- Previous concerns about renal (kidney) toxicity do not seem warranted, as long as there is no underlying renal disease
- Unfortunately, this does not seem to be effective for inclusion-body myositis (IBM) and possibly not for JDM

Muscle Nerve. 2016 Jan;53(1):58-66

Summary

- Eat a varied diet of mainly fresh plant-based foods, lean protein, good fats
- Avoid salt, bad fats, HFCS/sugars, processed and high-glycemic foods
- Focus on whole foods rather than supplements
- Consider probiotics
- Probably avoid spirulina and blue-green algae, possibly echinacea

Supplement Summary

- For all, but especially DM and those with darkly pigmented skin or those avoiding sun:
 - ✓ vitamin D level, aim for 40-50
- For anyone on methotrexate: take folic acid
- For PM, DM, IBM: consider gluten-free diet
- For IBM: consider modified Atkins
- For PM, DM: consider creatine
- Stay hopeful for more data on coenzyme Q10, whey and curcumin-piperine, but maybe worth a try

Resources: General

Center for Science in the Public Interest

www.cspinet.org

American Society for Nutrition

www.nutrition.org

Tufts University Healthletter

Healthletter.tufts.edu

Resources: Drug interactions

- http://drugs.com/drug_interactions
- <http://reference.medscape.com/drug-interactionchecker>
- <http://www.healthline.com/druginteractions>

Resources: Supplements

Consumer Labs (small fee to join)

consumerlab.com

Office of Dietary Supplements

ods.od.nih.gov

Linus Pauling Institute

lpi.oregonstate.edu/infocenter

National Center for Complementary and
Alternative Medicine (NIH)

nccam.nih.gov

Resources: Books

- *Eat to Live* by Joel Fuhrman, MD
(general healthy eating); drfuhrman.com
- *The Happiness Diet*, by Tyler Graham and Drew Ramsey, MD
- *Integrative Rheumatology* by Randy Horwitz, M.D. and David Muller, MD
- *Wheat Belly* by William Davis, MD (gluten sensitivity)
- *The Inside Tract* by Gerard Mullin, MD