Nutrition and Chronic Pain

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- **2003 WHO report**
  - Global change in diet resulting from industrialization, urbanization, and market globalization
  - Nutrition as a "major modifiable determinant of chronic disease."
- **CNS has specific nutritional requirements**
  - Essential fatty acids
  - Tryptophan
- **Micronutrients**
  - Vitamin B12 deficiency
  - Folate deficiency
  - Vitamin D deficiency
  - Scurvy
  - Other contributing factors

Nutritional strategies

- Optimizing the diet to ensure adequate intake of vitamins and essential amino acids
- Increasing intake of foodstuffs that reduce pain
- Restricting foodstuffs that may facilitate pain or reduce the effectiveness of oral analgesics

Obesity and chronic pain

- Growing evidence suggests that there is a precise relationship between obesity and chronic pain; they coexist and adversely impact each other (reciprocal negative effects).
- Obesity and pain serve to further reduce functional capacity and QoL, causing patients to become less physically active and more depressed, with consequences for sleep, stress, lifestyle, and chronic inflammation status.
- Accordingly, a reduction from high to normal BMI may improve QoL.

- The effect of obesity in chronic pain conditions has been studied in fibromyalgia, osteoarthritis, rheumatoid arthritis, and low back pain.
- Thus, the management of obesity as well as chronic pain should be considered synergistic.
- Adipose tissue is not only an energy store but also an active endocrine organ involved, among other functions, in the regulation of inflammation.
- Obese individuals suffer more chronic pain than normal weight subjects; therefore, changes in lifestyle can help improve both obesity and chronic pain conditions.

DIET AND INFLAMMATION

- "Western" dietary pattern
  - refined grains
  - high-fat foods,
  - processed meats, and sweetened
  - beverages/desserts
- Mediterranean diet
  - unrefined carbohydrates
  - nuts
  - fish
  - olive oil

Getting the right balance: the omega-3/omega-6 ratio

- Considerable change in the quantity and quality of fat consumed
- Considerably higher ratio of omega-6/omega-3 in food globally – so that the presumed "ideal" ratio of 1:1 is now 10-15:1
- The dietary omega-3/omega-6 ratio may have significance for inflammatory pain.

- The recommended intake of long-chain omega-3 PUFAs is 500 mg per day, but the actual intake in Western countries is much lower

- Omega-3 supplementation
  - Decrease overall production of PGE2 and LtB4, and increase production of PGI3 and LtB5

- reduces
  - patient-reported joint-pain intensity,
  - minutes of morning stiffness,
  - number of painful joints, and
  - NSAIDs consumption in patients

SATURATED FATS

- Saturated fats are known to have poor health outcomes associated with their intake, such as an increase in inflammatory cytokine gene expression.
- Dietary intake of SFAs has a direct stimulatory effect on the immune system via TLR4 that leads to induction of proinflammatory cytokines.
- This activation can prime the immune system in the event of future challenge and lead to hyperactive responses to damage or invasion potentially leading to chronic pain or hypersensitivity.
- This is a serious consideration for those consuming large quantities of SFAs in their diet.

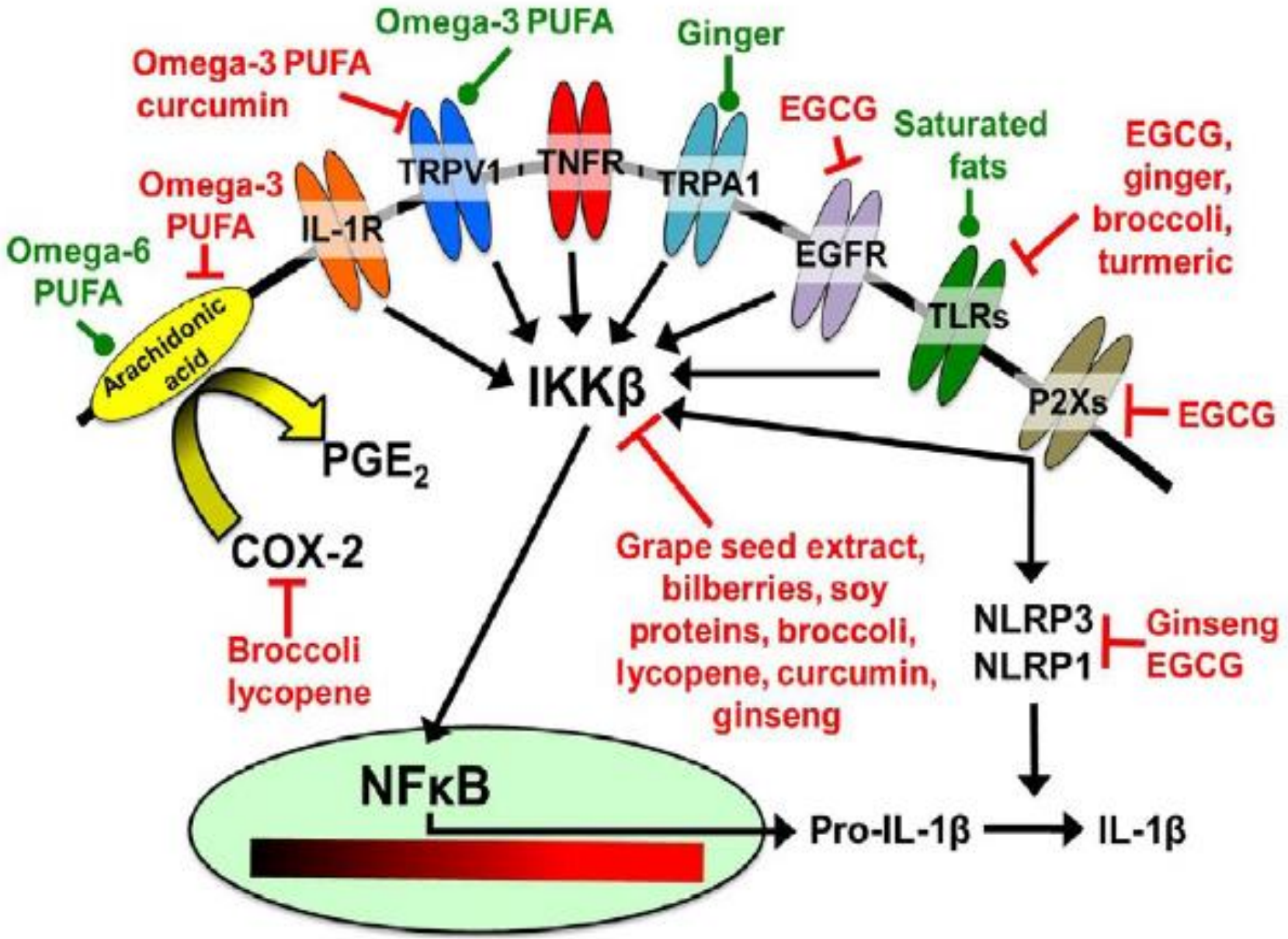
Antihyperalgesic effects of dietary constituents

- GRAPE SEED EXTRACT
  - High in anthocyanidins have a clear anti-inflammatory effect likely through inhibition of NFκB.
- GREEN TEA EXTRACT
  - potent anti-inflammatory effects of EGCG on immune cell receptors and pathways
- SOY PRODUCTS
  - soy-based diets have anti-inflammatory effects through activation of PPAR-γ and subsequent suppression of proinflammatory cytokine genes

- BROCCOLI
  - It is likely that cruciferous vegetables with high levels of sulforaphane, broccoli in particular, could reduce inflammation and subsequent pain if incorporated into the diet in sufficient amounts.
- CAROTENOIDS
  - Reduce a number of proinflammatory pathways
  - These foods are generally a large part of any dietary intervention (i.e., Mediterranean diet) and, at realistic consumable levels, should have a direct impact on pain transmission.

- GINGER
  - Recent researches support the long-held belief that ginger is a potent analgesic with clear antiinflammatory effects mediated through the immune cells.
- Turmeric
  - Similar to ginger, turmeric seems to work as an anti-inflammatory agent through multiple pathways and should be considered as an addition to the diet of patients suffering from chronic pain.

- GINSENG
  - Clear effect of ginseng on the pain pathway and a need for future clinical studies examining the efficacy of ginseng as a natural antiinflammatory.
- CAFFEINE
  - Blockade of adenosine receptors by caffeine would have a proinflammatory effect, thus, it appears that caffeine would have a negative effect on pain, but this is often not the case.
  - The positive effects in tension headaches maybe come from the established ability of caffeine to constrict cerebral blood flow (linked to the headache experienced in caffeine withdrawal)


Omega-3 PUFA
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curcumin
Ginger
EGCG
Saturated
fats
EGCG,
ginger,
broccoli,
turmeric
TRPV1
TNFR
TRPA1
Omega-3
PUFA
IL-1R
EGFR
Omega-6
PUFA
TLRs
Arachidonic
acid
IKKβ
P2Xs
EGCG
PGE2
COX-2
Broccoli
lycopene
Grape seed extract,
bilberries, soy
proteins, broccoli,
lycopene, curcumin,
ginseng
NLRP3
NLRP1
Ginseng
EGCG
NFκB
Pro-IL-1β
IL-1β

Influence of pro-algesic foods on chronic pain conditions

- It is known that some foods can trigger pain or aggravate existing pain conditions.
  - Consumption of gluten by individuals with gluten sensitivity can lead to gastrointestinal tract pain.
  - Migraine headache is known to be triggered in some sufferers by specific foods like chocolate or wine.

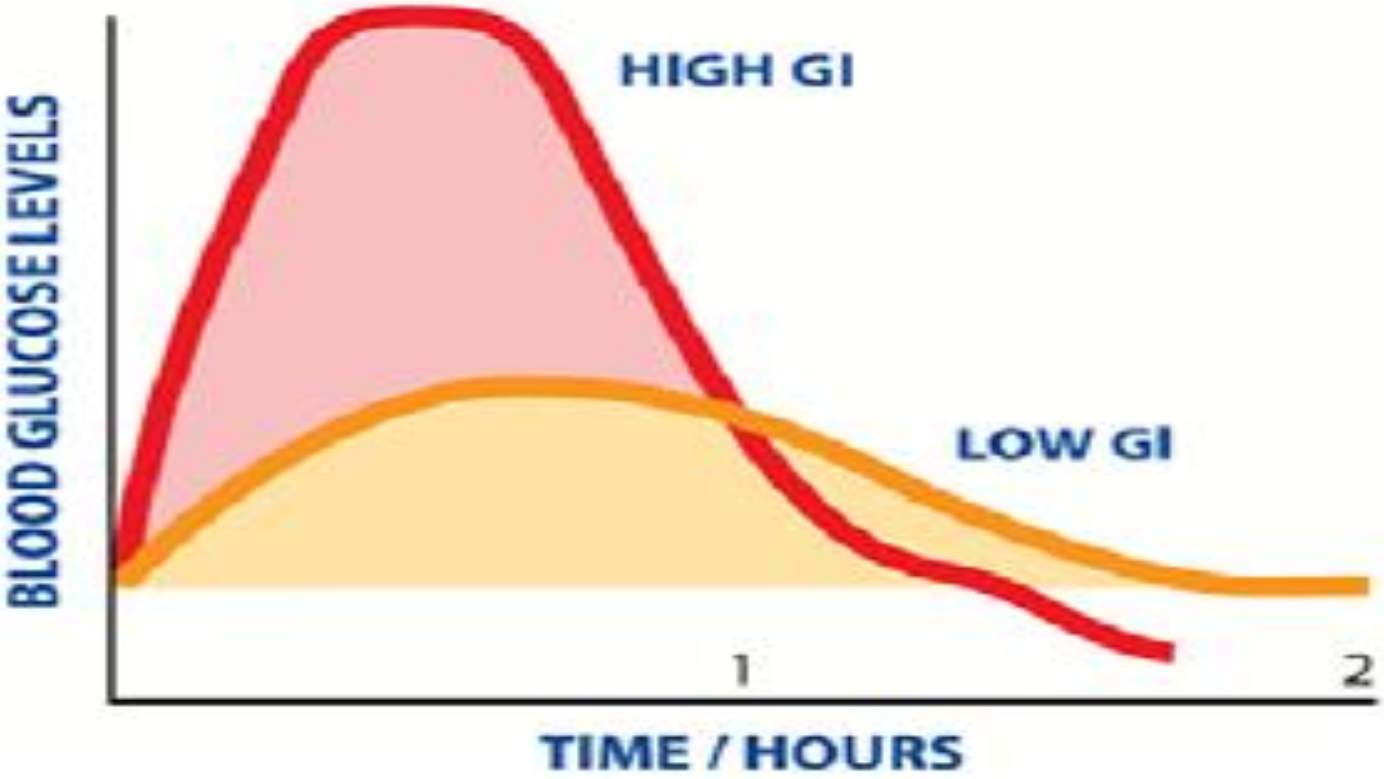
- less is known about the potential interaction between intake of specific dietary components and chronic pain conditions.

TRANS FATS

- A study conducted at Harvard University, which appeared in The Journal of Nutrition, set out to find out whether trans fat simply increases cholesterol, or whether it is also pro-inflammatory.
- They found the more trans fats someone ate, the more inflammation was happening in their body. This association was independent of other possible causes of inflammation (e.g. saturated fat intake or obesity).

- Source: Lopez-Garcia E. Consumption of trans fatty acids is related to plasma biomarkers of inflammation and endothelial dysfunction. J Nutr. 2005 Mar;135(3):562-6

High Glycemic Index Foods



High Glycemic Index Foods

- Low GI diets have been shown to lower the risk of many chronic diseases that have an inflammatory cause (i.e. obesity, diabetes, back pain and heart disease).
- When you eat a high GI food, you get a "spike" in blood sugar. In response, your body has to release a ton of insulin to get your blood glucose under control. Insulin is a hormone that your body makes to get glucose out of your blood and into your cells where they belong. If a spike in insulin happens occasionally, your body has no problem adapting.
- However, if this occurs again and again, your body has a tougher time keeping up. Your body's response to this is increasing inflammation.

High Glycemic Index Foods

- Another study conducted at Harvard University, that appeared in the journal The American Journal of Clinical Nutrition showed a diet of high GI foods increases inflammation.
- They found that the higher the CRP (inflammation), the higher GI the diet tended to be. "Dietary glycemic index is significantly and positively associated with plasma CRP."

Source: Liu S. Relation between a diet with a high glycemic load and plasma concentrations of high-sensitivity C-reactive protein in middle-aged women. Am J Clin Nutr. 2002 Mar;75(3):492-8

Glycemic Index

Foods High In GI

- • Sugary (i.e. candy)
- • Processed (i.e. white bread)
- • Low in Fiber (i.e.. white rice)
- • Low in Protein (i.e.. rice cakes)

Foods Low in GI

- • Produce (i.e. most fruits and vegetables)
- • Minimally Processed (i.e. whole wheat bread)
- • High in Fiber (i.e. beans)

VITAMIN D

- *For decades, we've been talking about the importance of Calcium in the diet. The time has come to get the word out about vitamin D and its contribution to good musculoskeletal health.*
- Vitamin D has the unique property of being made in your skin with the help of sunlight. This is why it is commonly referred to as the "Sunshine vitamin".
- *"Vitamin D deficiency is an unrecognized epidemic in both children and adults throughout the world."*

Vitamin D Influences

- Cell Growth
- Insulin Resistance (Diabetes)
- Immunity
- Muscle Function
- Nervous System
- Cardiovascular System
- Blood Pressure
- Inflammation
- Low Back Pain

How Can vitamin D Improve Pain?

- *Inflammation Reduction*
- *Improve Nerve Function*
- *Increased Muscle Strength*
- *Helps Pain Medication Work Better*

The muscles that support your spine are dependent on Vitamin D

VITAMIN D

- There are a lot of different recommendations as to the amount of Vitamin D to take.
- The literature and scientists recommend 2,000-4,000 IU daily
- Also get a “sensible exposure” to sunlight.
- “Screening for vitamin D deficiency should be performed for all patients with chronic pain”
- The only way to be sure that you are getting enough vitamin D is by getting a blood test called a 25OHD test.
- Supplements are a safe, effective, and inexpensive way to get vitamin D.

THANK YOU AND ANY QUESTION?