Functional Medicine- Osteopathy at its Best!

Aunna Herbst, DO, ND, CFMP

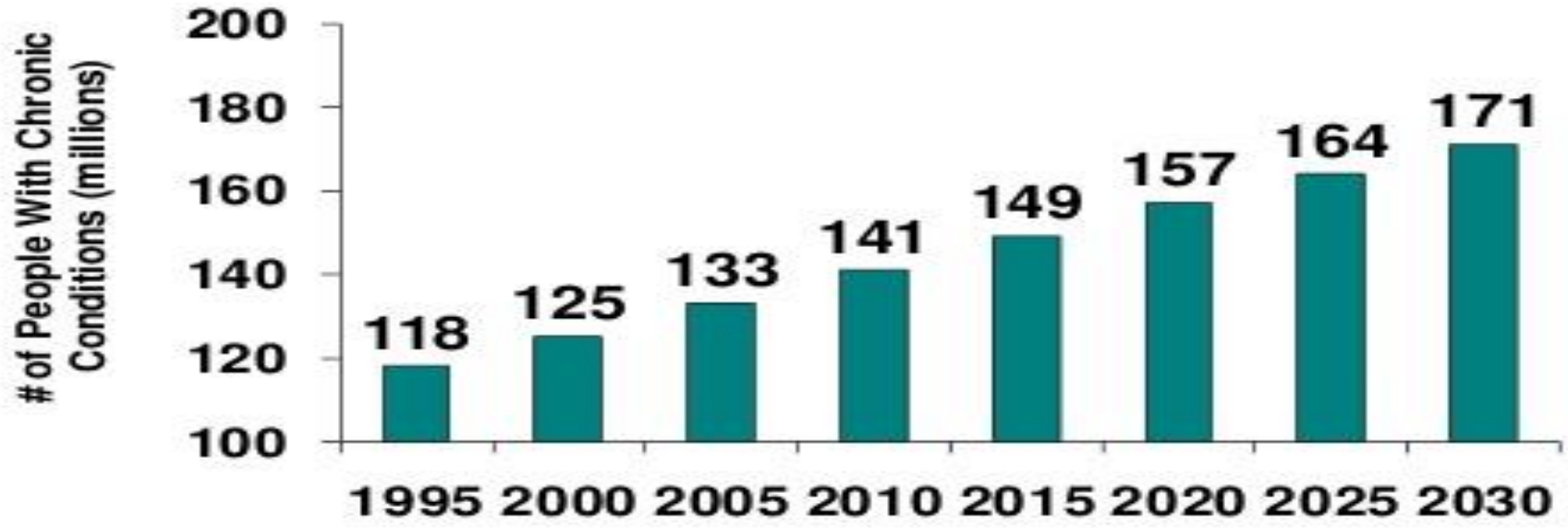
Cleveland Clinic Center for Functional Medicine

Objectives

- Introduce Functional Medicine
- Introduce Center for Functional Med – Cleveland Clinic
- How OMT can and should play a role in our approach to chronic disease
- Case study

Cleveland Clinic
THE INSTITUTE FOR FUNCTIONAL MEDICINE®

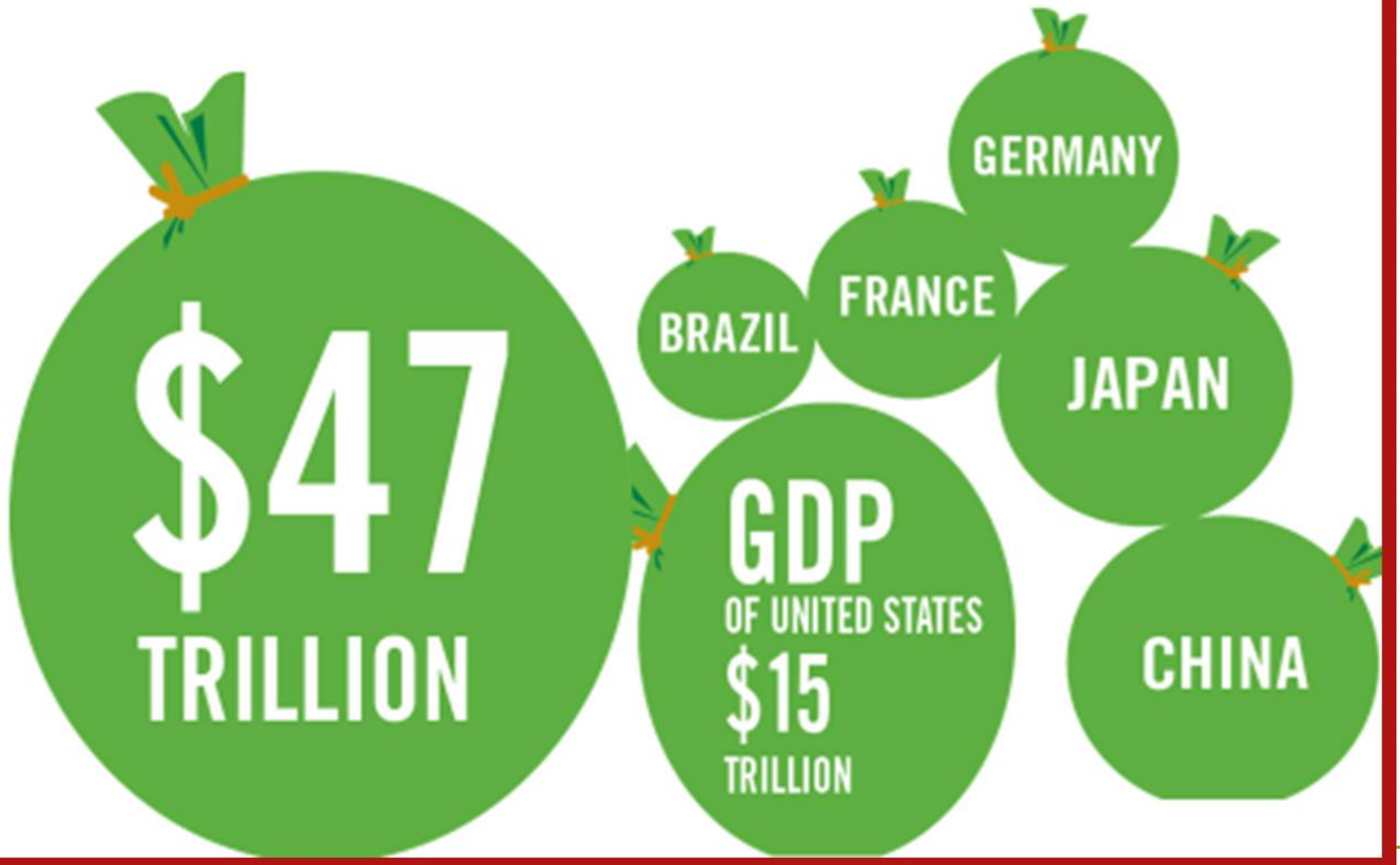
America's Health Care Crisis
People with Chronic Conditions



Source: Wu, Shin-Yi and Green, Anthony. *Projection of Chronic Illness Prevalence and Cost Inflation.* RAND Corporation, October 2000.

Alcatel-Lucent

Data: World Economic Forum 2011



- Increase in incidence of obesity and diabetes and cardiovascular disease

- Childhood obesity = 1000% increase in type 2 diabetes in children

- Increase in neurodegenerative, mood disorders, allergic, autoimmune/ inflammatory disorders, digestive disorders (GERD) and cancer

- Decrease in life expectancy of 2-5 years

The Problem???

Trying to use 20th century ACUTE care diagnosis and treatment model in a 21st century CHRONIC multi-systems disease epidemic

Genes to Society”—The Logic and Process of the New Curriculum for the Johns Hopkins University School of Medicine

Wiener, Charles M. MD; Thomas, Patricia A. MD; Goodspeed, Elizabeth MHS; Valle, David MD; Nichols, David G. MD

Academic Medicine: March 2010 - Volume 85 - Issue 3 - pp 498-506

Curriculum Renewal

In August 2009, the Johns Hopkins University School of Medicine implemented a new curriculum, “Genes to Society” (GTS), aimed at reframing the context of health and illness more broadly, to encourage students to explore the biologic properties of a patient's health within a larger, integrated system including social, cultural, psychological, and environmental variables. This approach presents the patient's phenotype as the sum of internal (genes, defined system. Unique genotypic and societal dichotomy of health and illness, preferring to vie S grew out of a perceived need to reformulate th y from the genome to the environment. This artic ment of the new curriculum, commissio nt, and creation of a vertical and horizontal allenges of implementing GTS were leadership su unnel vision, and the use of pilot courses to test concepts and methods. GTS can be viewed as the foundation for the scientific and clinical career development of future physicians.

Future physicians will integrate individual evidence into a biologic system that extends from genes and the genome to the environment and society.

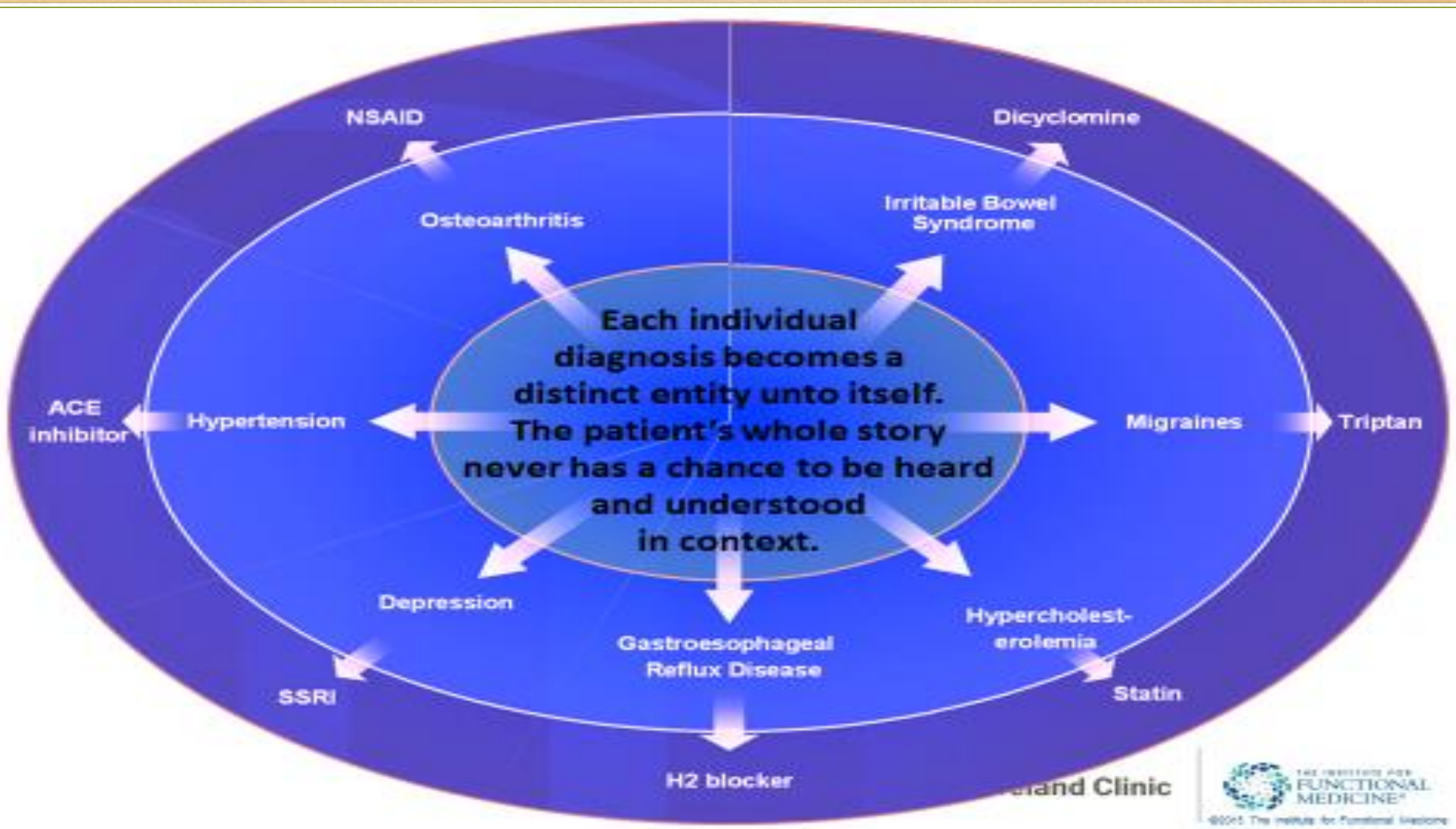
Functional Medicine

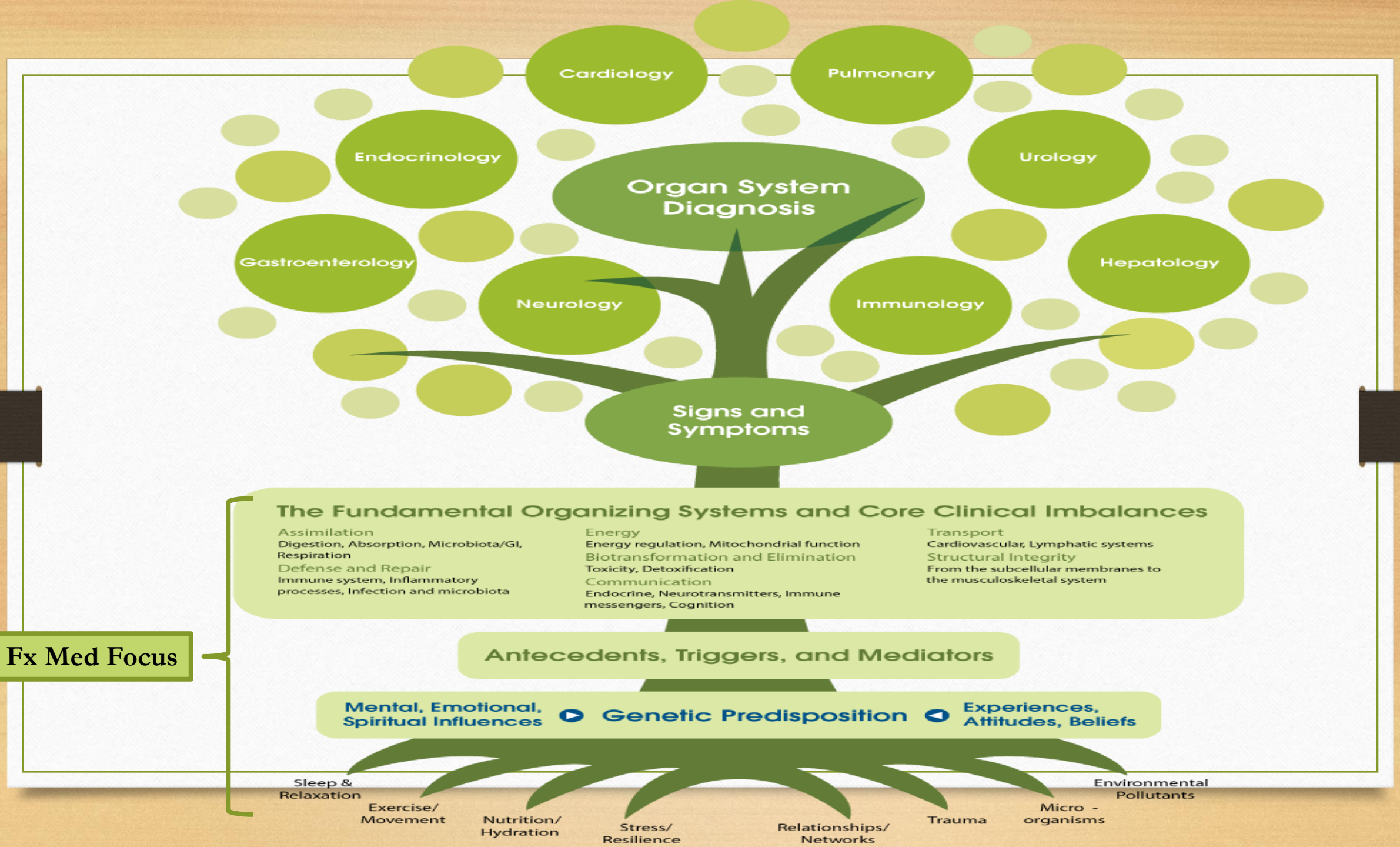
Functional medicine is a systems-based personalized healthcare approach that assesses and treats underlying causes of illness through individually tailored therapies to restore health and improve function.

Center for Functional Medicine
Cleveland Clinic

- Patient care – systems based model
- Research
- Medical Education
- Community and Population Health


50 million deaths EVERY year from
Non-Communicable Diseases
$47 TRILLION spent over 20 years
$2 TRILLION lost productivity every year


NSAID
Dicyclomine
Osteoarthritis
Irritable Bowel Syndrome
Each individual diagnosis becomes a distinct entity unto itself. The patient's whole story never has a chance to be heard and understood in context.
ACE inhibitor
Hypertension
Migraines
Triptan
Depression
Gastroesophageal Reflux Disease
Hypercholest-erolemia
SSRI
Statin
H2 blocker
Clinic
FUNCTIONAL MEDICINE


Cardiology
Pulmonary
Endocrinology
Urology
Organ System Diagnosis
Gastroenterology
Hepatology
Neurology
Immunology
Signs and Symptoms
The Fundamental Organizing Systems and Core Clinical Imbalances
Assimilation
Digestion, Absorption, Microbiota/GI, Respiration
Defense and Repair
Immune system, Inflammatory processes, Infection and microbiota
Energy
Energy regulation, Mitochondrial function
Biotransformation and Elimination
Toxicity, Detoxification
Communication
Endocrine, Neurotransmitters, Immune messengers, Cognition
Transport
Cardiovascular, Lymphatic systems
Structural Integrity
From the subcellular membranes to the musculoskeletal system
Antecedents, Triggers, and Mediators
Mental, Emotional, Spiritual Influences
Genetic Predisposition
Experiences, Attitudes, Beliefs
Sleep & Relaxation
Exercise/ Movement
Nutrition/ Hydration
Stress/ Resilience
Relationships/ Networks
Trauma
Micro - organisms
Environmental Pollutants
Fx Med Focus

THE INSTITUTE FOR FUNCTIONAL MEDICINE®

FUNCTIONAL MEDICINE MATRIX

Retelling the Patient's Story

Antecedents
(Predisposing Factors—Genetic/Environmental)

Triggering Events
(Activators)

Mediators/Perpetuators
(Contributors)

Physiology and Function: Organizing the Patient's Clinical Imbalances

Assimilation
(e.g., Digestion, Absorption, Microbiota/GI, Respiration)

Defense & Repair
(e.g., Immune, Inflammation, Infection/Microbiota)

Structural Integrity
(e.g., from Subcellular Membranes to Musculoskeletal Structure)

Energy
(e.g., Energy Regulation, Mitochondrial Function)

Communication
(e.g., Endocrine, Neurotransmitters, Immune messengers)

Biotransformation & Elimination
(e.g., Toxicity, Detoxification)

Transport
(e.g., Cardiovascular; Lymphatic System)

Modifiable Personal Lifestyle Factors

Sleep & Relaxation	Exercise & Movement	Nutrition	Stress	Relationships

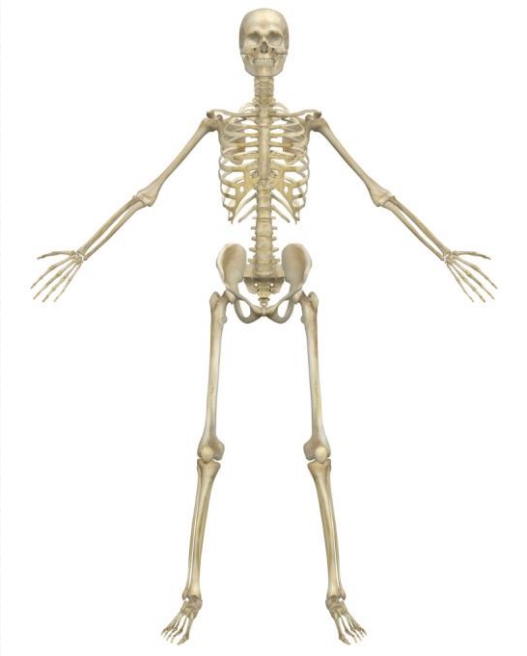
Name: _____ Date: _____ CC: _____

MATRIX

- Communication
- Assimilation
- Structural Integrity
- Defense Repair
- Biotransformation
- Energy

Structural Integrity

- Musculoskeletal Dysfunction
  - Myofascial
  - Bones
  - Cartilage
  - Tendons/Ligaments
- Subcellular Membrane

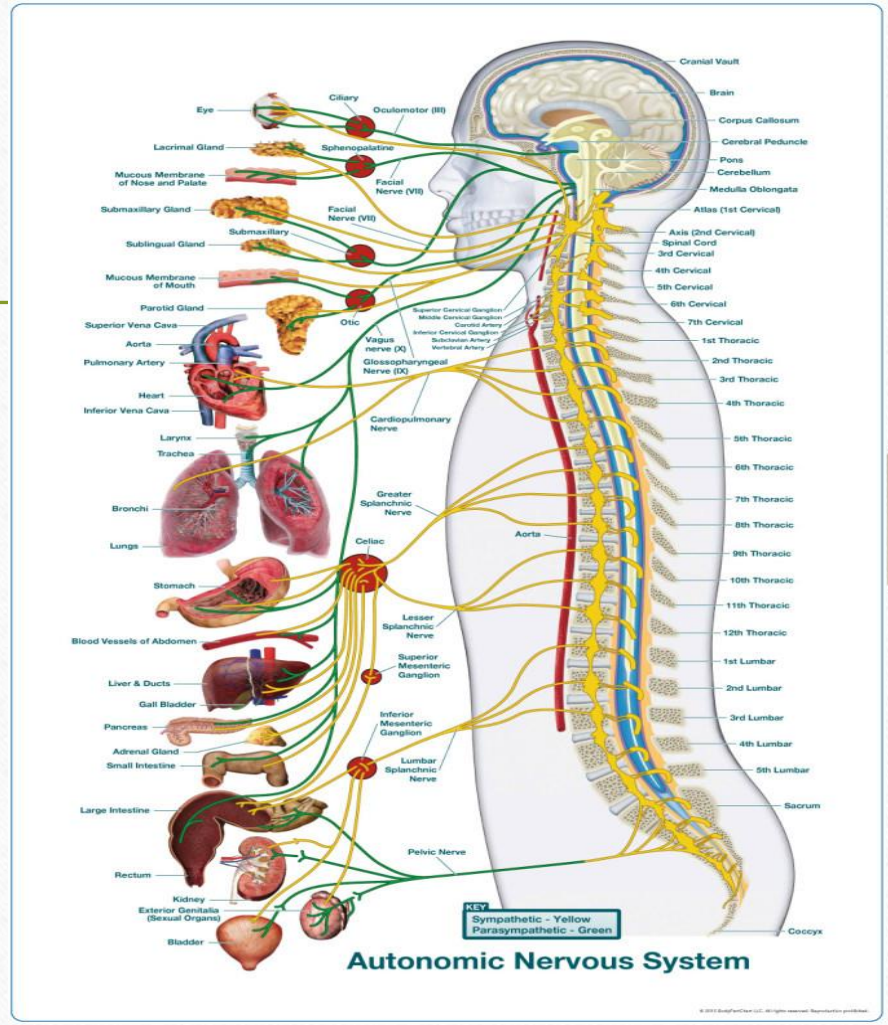


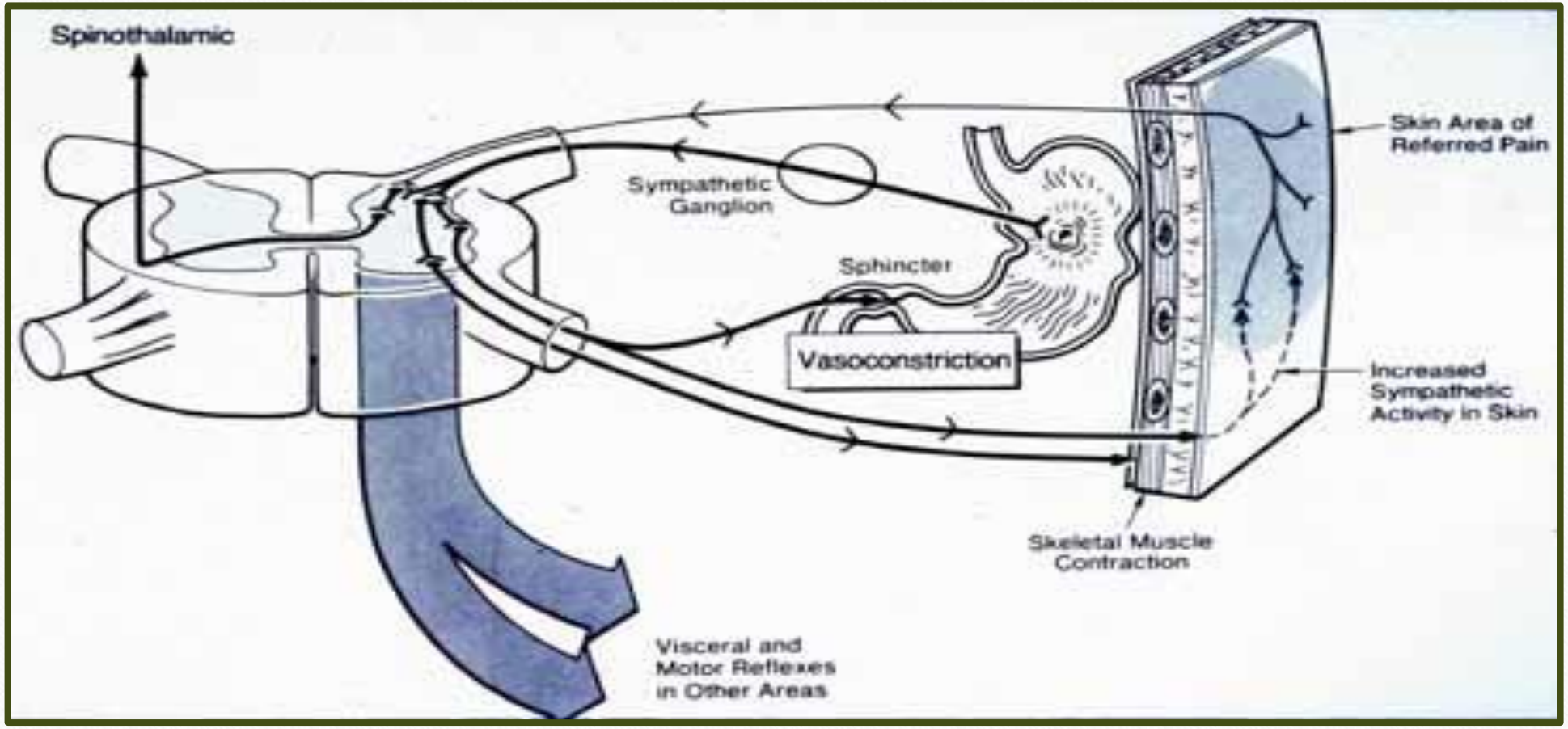
“We conclude that when the fluids of the body are stopped in the fascia, organs, and other parts of the system, stagnation, fermentation, heat and general confusion will follow….”

- AT Still 1828-1917

MYOFASCIAL PAIN

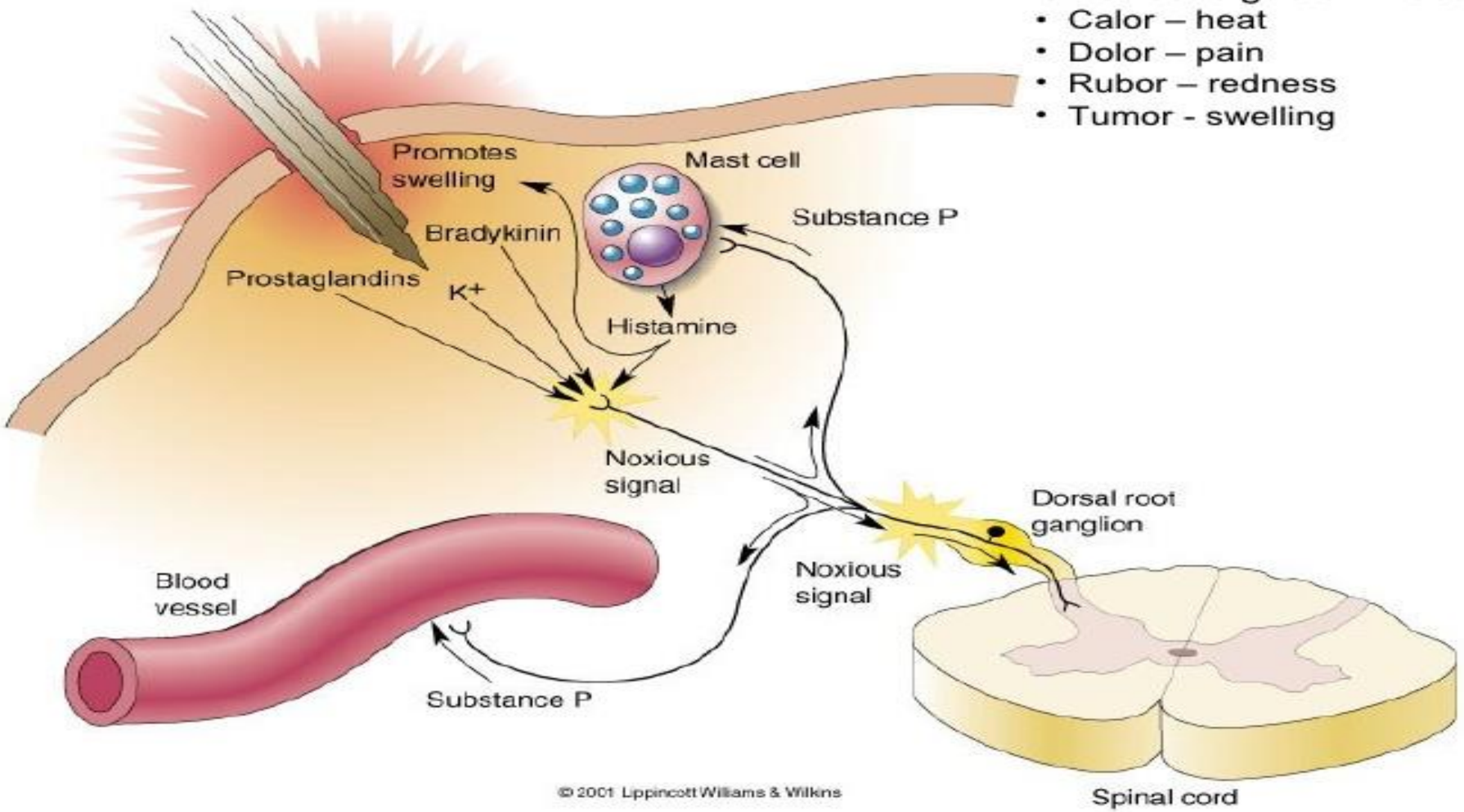
- Pathophysiology
- Nutrients play what role??
- Referred triggers (other illness/disease)





Sensitizing agents → ROS→ cell damage→ chronic symptom presentation-→ change in gene expression

Figure 12.24
Peripheral chemical mediators of pain and hyperalgesia.



Shah JP, Danoff JV, Desai MJ, et al. **Biochemicals associated with pain and inflammation are elevated in sites near to and remote from active myofascial trigger points.** *Arch Phys Med Rehabil* 2008; 89:16–23.

Significant rise in proinflammatory cytokines IL-8 and TNF α [15] but no significant changes in IL-4, IL-6, and IL-10 have been reported.

Wang H, Buchner M, Moser MT, Daniel V, et al. **Circulating cytokine levels com[illegible]d to pain in patients with fibromyalgia**. Clin J Pain. 2009;25

Rachlin ES. Myofascial Pain and Fibromyalgia Trigger Point Management. St Louis, Mosby- Yearbook: 1994. History and physical examination for regional myofascial pain syndrome; p. 169.

Medicine (Baltimore) 2016 Sep; 95(37): e4650.
Published online 2016 Sep 16. doi: PMCID: PMC5402557
Circulating biomarkers in acute myofascial pain
A case–control study
Liza Grosman-Rimon, PhD, et al.

Kuchera ML, Kuchera WA. *Osteopathic Considerations in Systemic Dysfunction.* 2nd edition. Columbus, Ohio: Greyden Press, 1994.

Steele KM. Treatment of the acutely ill hospitalized patient. In: Kappler RE, Kelso AF, Kuchera JL, et al, editors. *Foundations* MD: Williams & Wilkins; 1997.

Sato A. Reflex modulation Howell JN, editors. *1989 Ameri* Ltd, Ar

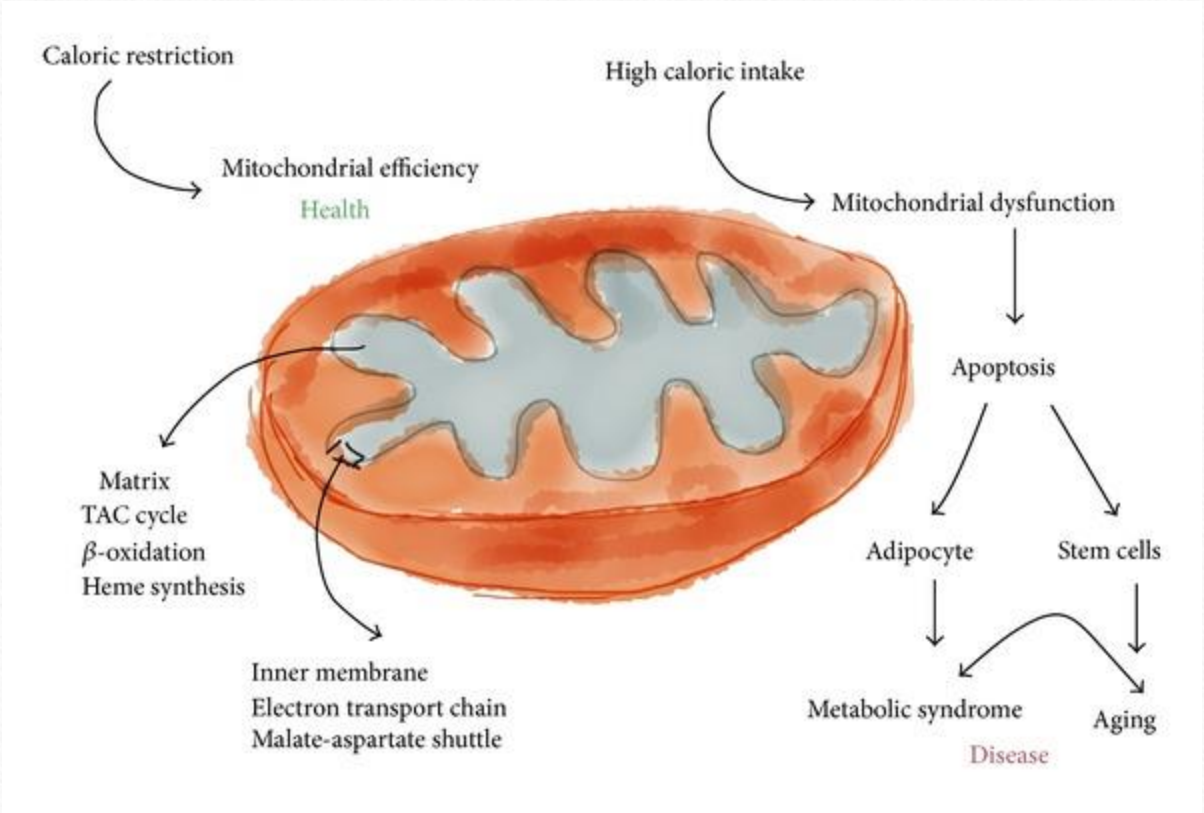
Indian J Anaesth. 2009 Oct; 53(5): 575–581.
PMCID: PMC2900090
Fibromyalgia and Myofascial Pain Syndrome-A Dilemma
J C Chandola[1] and Arunangshu Chakraborty[2]

Chronic inflammation induces telomere dysfunction and accelerates aging in mice
Nature 2014

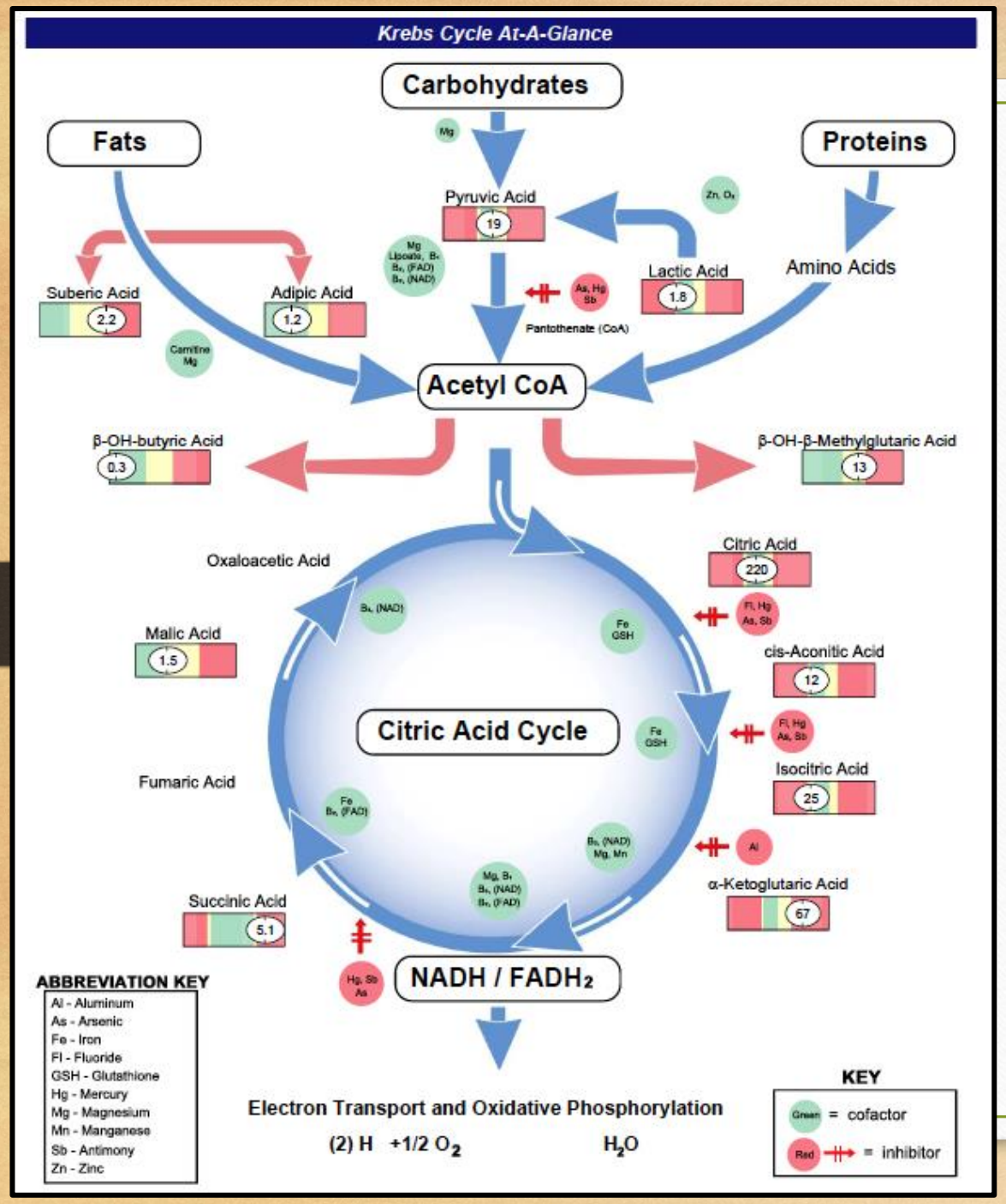
Our results show that chronic inflammation aggravates telomere dysfunction and cell senescence, decreases regenerative potential in multiple tissues and accelerates ageing of mice. Anti-inflammatory or antioxidant treatment, specifically COX-2 inhibition, rescued telomere dysfunction, cell senescence and tissue regenerative potential, indicating that chronic inflammation may accelerate ageing at least partially in a cell-autonomous manner via COX-2-dependent hyper-production of ROS.

I see ... So, your medicine fell down the sink by accident. And it was just your pain pills, not your blood pressure tablets.

someecards
user card



Editor in Chief Nutrition Evidence – Miguel Turibio-Mateas



Vitamins play key roles of the Citric Acid Cycle

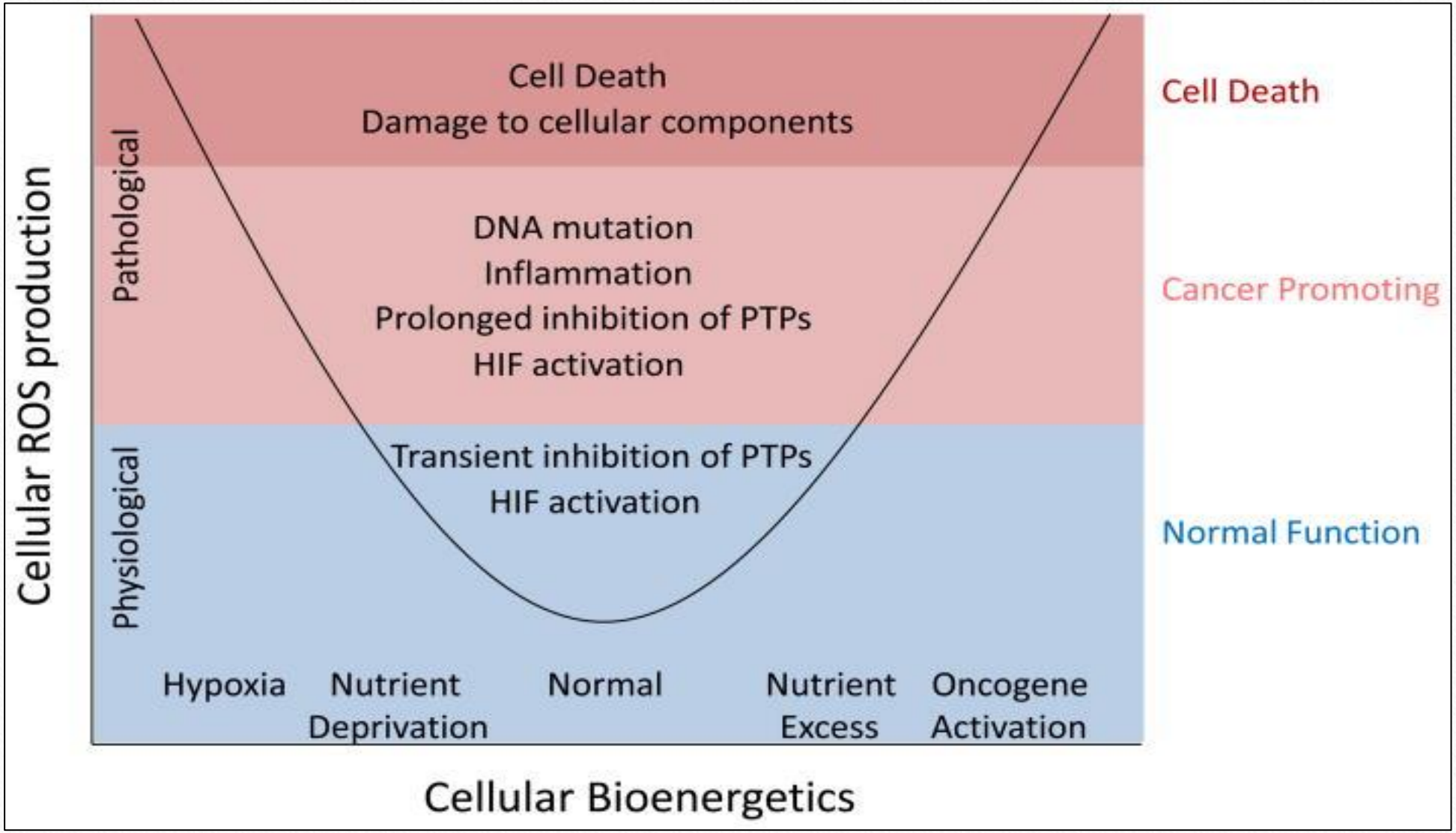
Four of the B vitamins are essential in the citric acid cycle :

1. Ribovlavin ⟶ FAD
2. Niacin ⟶ NAD
3. Thiamin ⟶ TPP
4. Pantothenic acid ⟶ CoA

The B vitamins are essential in energy yielding metabolism by dehydrogenase enzyme :

- FAD ⟶ 2 mol ATP
- NAD ⟶ 3 mol ATP

COQ10


Cellular ROS production
Pathological
Physiological
Cell Death
Damage to cellular components
DNA mutation
Inflammation
Prolonged inhibition of PTPs
HIF activation
Transient inhibition of PTPs
HIF activation
Hypoxia
Nutrient Deprivation
Normal
Nutrient Excess
Oncogene Activation
Cellular Bioenergetics
Cell Death
Cancer Promoting
Normal Function

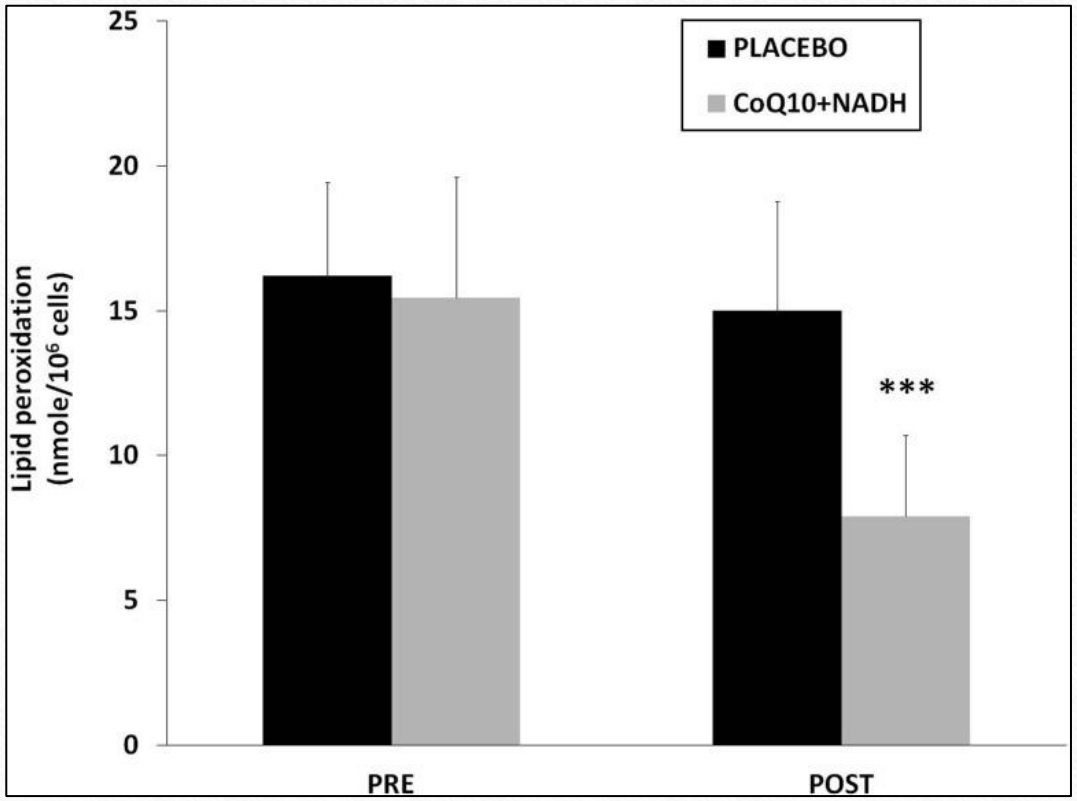


Figure 9. Lipid peroxidation markers pre- and post-intervention with oral NADH and CoQ10.

Does Oral Coenzyme Q_{10} Plus NADH Supplementation Improve Fatigue and Biochemical Parameters in Chronic Fatigue Syndrome?

Castro-Marrero Jesús, Cordero Mario D., Segundo María José, et al.. Antioxidants & Redox Signaling. November 2014, 22(8): 679-685.
Published in Volume: 22 Issue 8: November 11, 2014

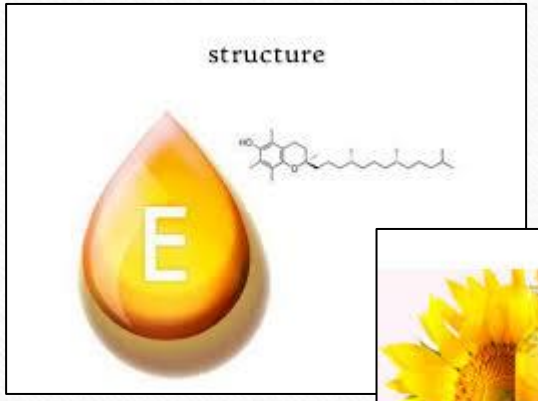
DIET

World J Gastroenterol. 2013 Oct 21; 19(39): 6540–6547.

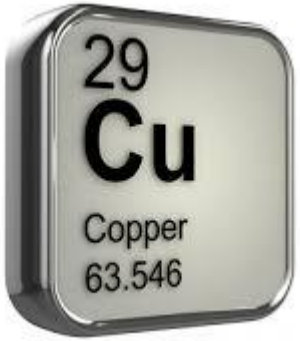
Published online 2013 Oct 21. PMC3801366 Mohammed A Alzoghaibi

Concepts of oxidative stress and antioxidant defense in Crohn's disease

VIT A, C, E and B-carotene LOW→ higher ROS



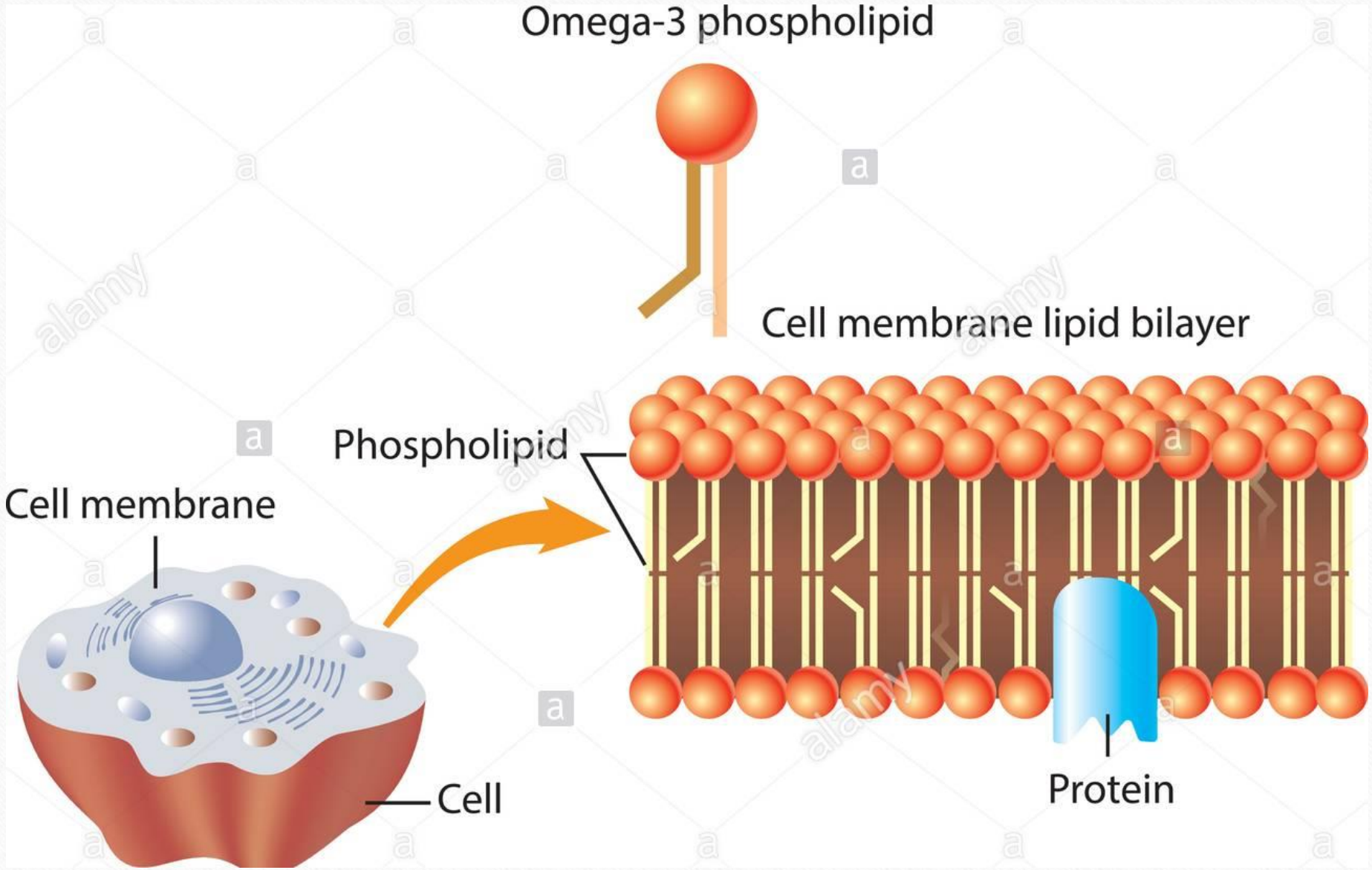
DIET



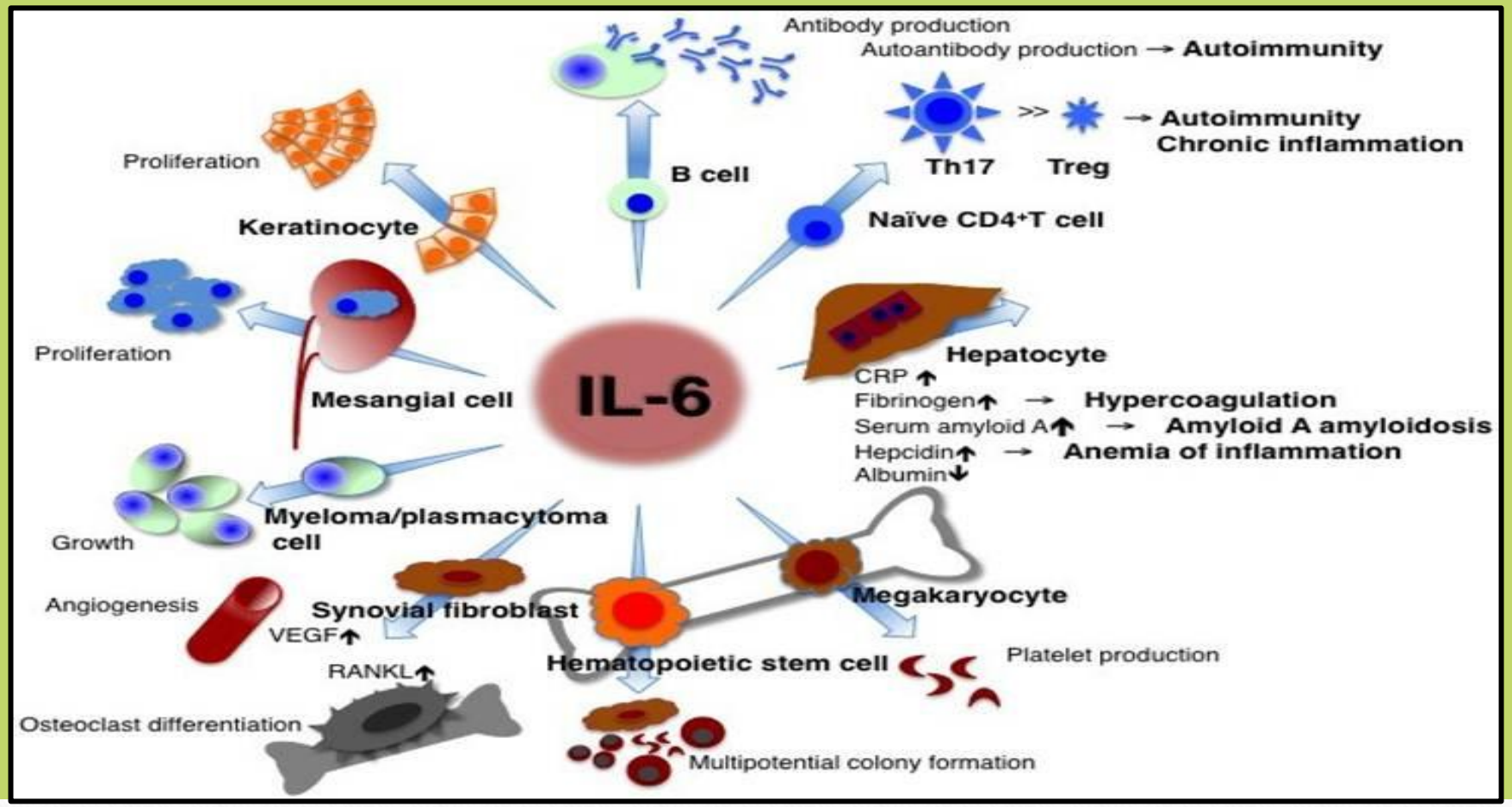
OMEGA 3/6

- **Consensus from nutritional experts is that the omega-6 to omega-3 ratio should be no greater than 4:1, and ideally 1:1 for optimal health.**

- If following the Standard American Diet (SAD), the ratio may be 25:1 or higher in favor of omega-6. **This imbalance promotes inflammation, pain, and will compromise your ability to quickly recover from pain or injury.**


Omega-3 phospholipid
Cell membrane lipid bilayer
Phospholipid
Cell membrane
Cell
Protein

Vitamin D also inhibits synthesis of IL-6 by monocytes, which is the primary stimulant of CRP production in the liver



Irritable Bowel Syndrome/Abdominal Pain

- 25 y/o female
- IBS c/d, Abd pain LUQ, Fibromyalgia
- Labs from outside: CBC, CMP, TSH – neg
- GI: Linzess tried, colonoscopy/EGD negative
- Neuro consult: fibromyalgia Dxd, tender pt 16/18, tried Lyrica and Gabapentin

Initial Visit

PE: ttp18/18 pts, white spots in nails, tongue scalloped, beefy red, ttp LUQ, patellar hyperreflexia b/l, no organomegaly, no rash, skin color changes/trauma--nml exam otherwise

- **Labs Ordered**: GI microscopic culture and Eval, Nutritional status evaluated

- Treated one MTp on LUQ and rib 9-11 with myofascial release →IMPROVED IN OFFICE

"To prevent a heart attack, take one aspirin every day. Take it out for a run, then take it to the gym, then take it for a bike ride..."

Nutrition/Health Coach

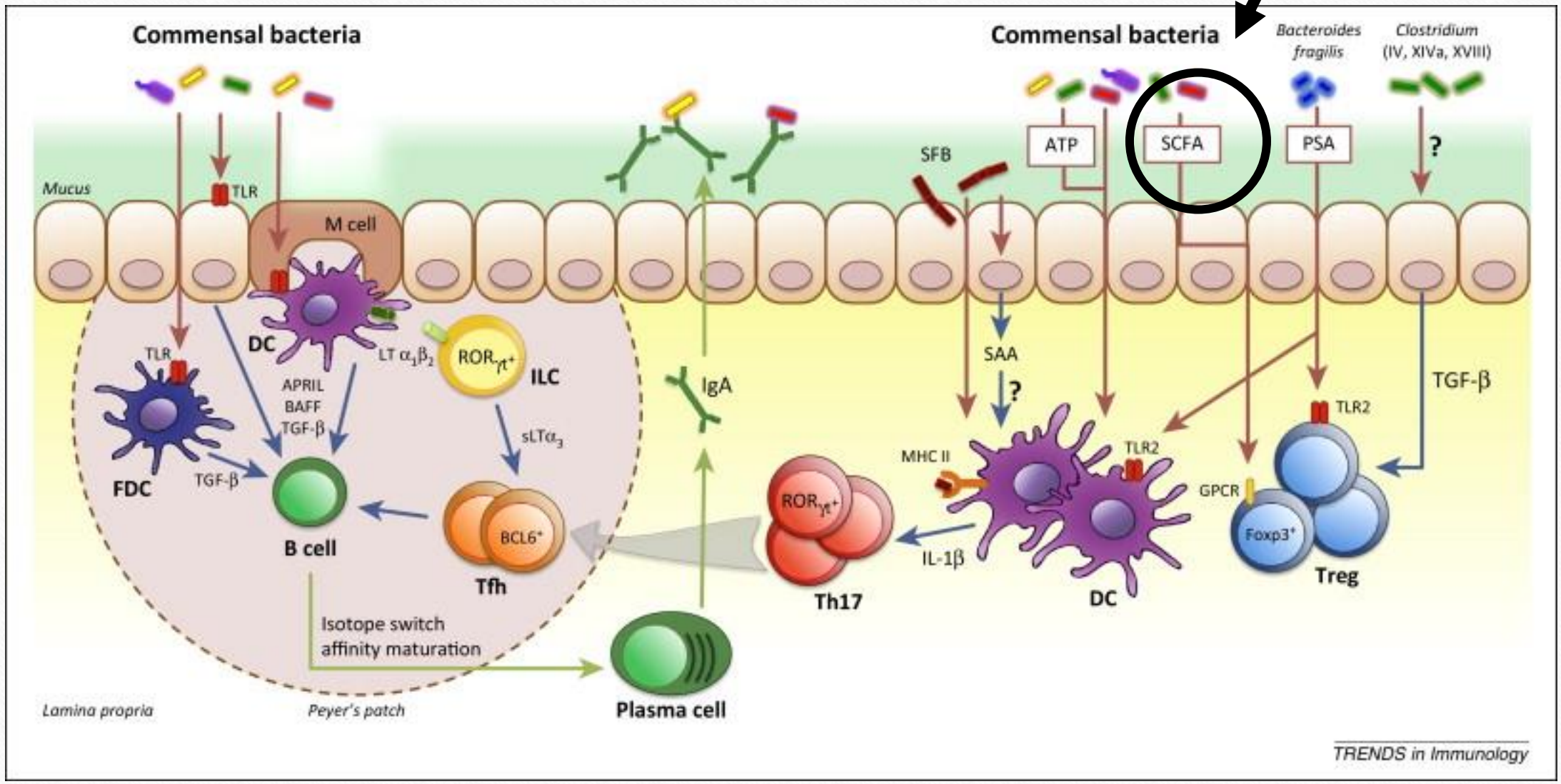
- Started on basic “clean eating plan” – eliminated added sugar, processed foods/drinks
- Deep breathing 10 mins daily
- Meditative walking as tolerated and 10 mins stretching as tolerated
- Sleep to continue with reg routine bedtime 10p-6a
- Journal for stress outlet

Follow up visit

- MfTp per pt request
- **Comprehensive Stool Cx:** pancreatic elastase 177, Commensal bacteria overgrowth 18/22, **low SCFA**, fecal sIgA elevated, low growth bifidobacter sp. by PCR cx
- **Nutritional eval (serum and urine)**:

  low B1, B12, folate, Zinc and several amino acids including glutamine, methionine and araginine (high need)

  MSQ 94 PROMIS 28% PH


Commensal bacteria
Commensal bacteria
Bacteroides fragilis
Clostridium (IV, XIVa, XVIII)
Mucus
TLR
M cell
SFB
ATP
SCFA
PSA
?
DC
LT $\alpha_1\beta_2$
RORγt^+
ILC
APRIL
BAFF
TGF-β
SAA
?
TGF-β
IgA
TLR
FDC
TGF-β
B cell
BCL6$^+$
Tfh
sLTα_3
RORγt^+
Th17
MHC II
TLR2
IL-1β
DC
GPCR
TLR2
Foxp3$^+$
Treg
Isotope switch
affinity maturation
Plasma cell
Lamina propria
Peyer's patch
TRENDS in Immunology

Zinc Def

PLoS One. 2016; 11(10): e0164302.
Published online 2016 Oct 18. PMCID: PMC5068745

Selenium and Zinc Status in Chronic Myofascial Pain: Serum and Erythrocyte Concentrations and Food Intake

João Araújo Barros-Neto,[1,*] Adelmir Souza-Machado,[2] Durval Campos Kraychete,[3] Rosangela Passos de Jesus,[4] Matheus Lopes Cortes,[5] Michele dos Santos Lima

J Back Musculoskeletal Rehabil. 2010;23(4):187-91.

The relationship between serum trace elements, vitamin B12, folic acid and clinical parameters in patients with myofascial pain syndrome.

Okmumus M, Ceceli E, Tuncay F, Palulu N, et al.

Natl J Maxillofac Surg. 2014 Jul-Dec; 5(2): 109–116.

doi: 10.4103/0975-5950.154810

PMCID: PMC4405950

Trends in management of myofacial pain

Uma Shanker Pal, Lakshya Kumar,[1]

BMC Oral Health. 2016; 16: 60.

Published online 2016 May 27. doi: 10.1186/s12903-016-0215-y

PMCID: PMC4884371

Oral manifestations in vitamin B_{12} deficiency patients with or without history of gastrectomy

Jihoon Kim

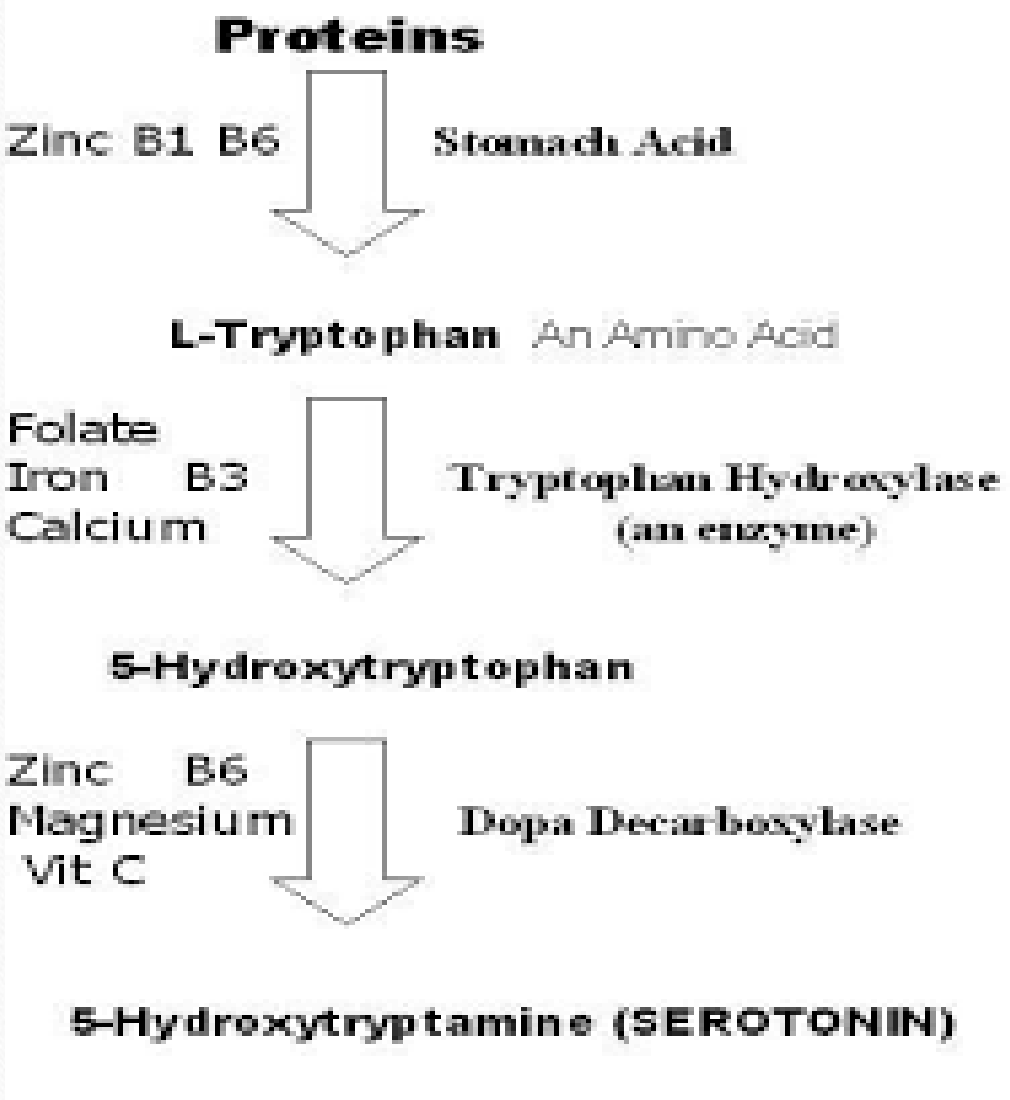
Amino Acid Deficiencies

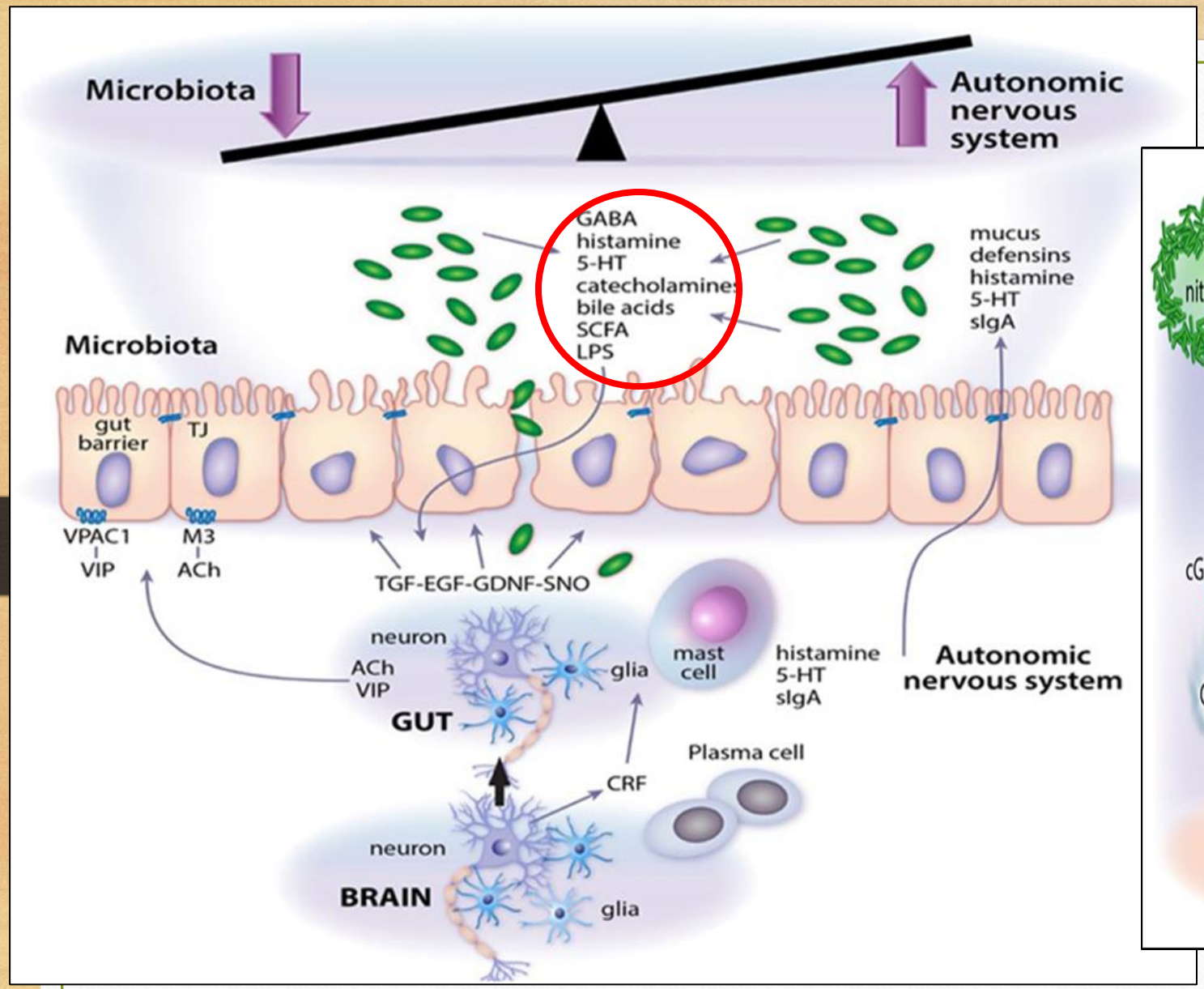
Arginine

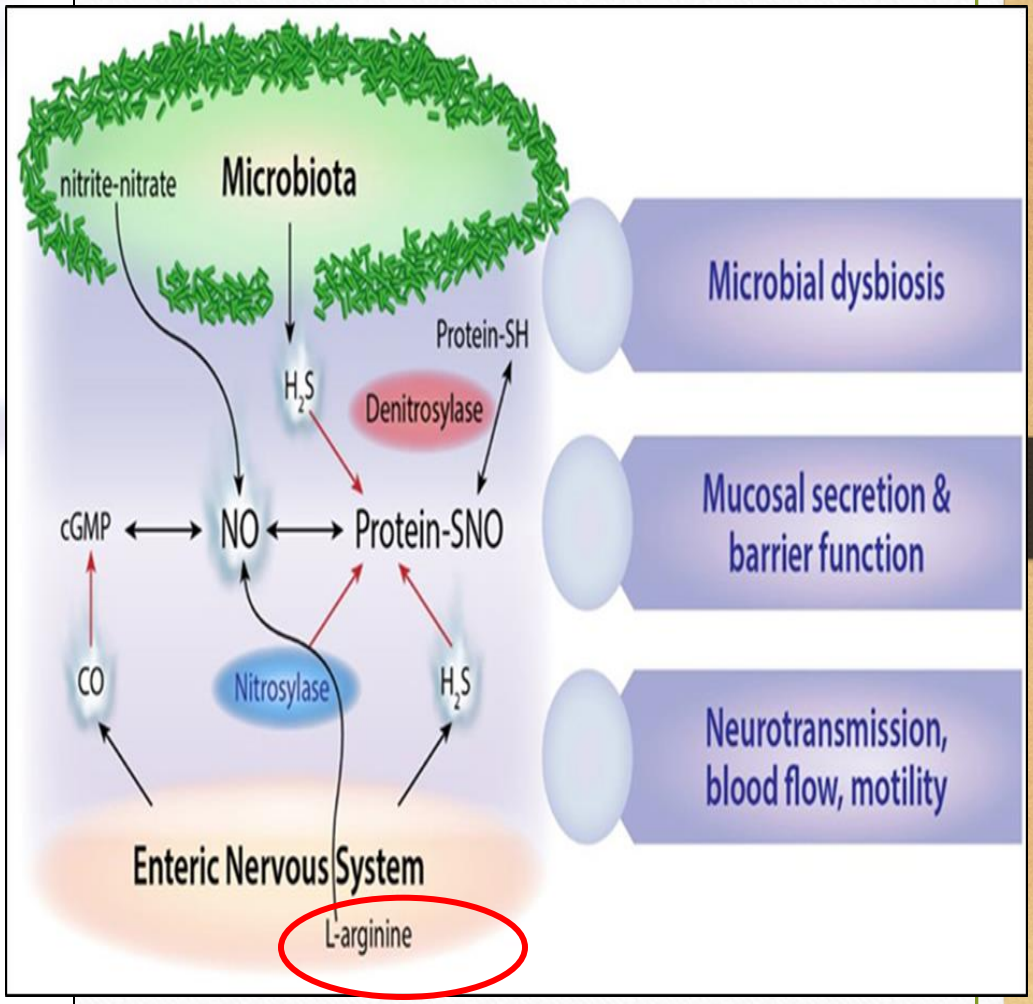
Methoinine

Glycine

L-tryptophan




Microbiota
Autonomic nervous system
GABA
histamine
5-HT
catecholamines
bile acids
SCFA
LPS
mucus
defensins
histamine
5-HT
sIgA
Microbiota
gut barrier
TJ
VPAC1
VIP
M3
ACh
TGF-EGF-GDNF-SNO
neuron
ACh
VIP
glia
GUT
mast cell
histamine
5-HT
sIgA
Autonomic nervous system
Plasma cell
CRF
neuron
BRAIN
glia


nitrite-nitrate
Microbiota
Protein-SH
H_2S
Denitrosylase
cGMP
NO
Protein-SNO
CO
Nitrosylase
H_2S
Enteric Nervous System
L-arginine
Microbial dysbiosis
Mucosal secretion & barrier function
Neurotransmission, blood flow, motility

World J Gastroenterology. 2016 Feb 21; 22(7): 2219–2241.
Published online 2016 Feb 21.

Gut microbiota role in irritable bowel syndrome: New therapeutic strategies.

Elenora Distrutti, Lorenzo Munaldi, et al.

It is now recognized that a significant portion of the metabolites circulating in mammalian blood derives from the intestinal microbial community[21-25] and the presence or absence of the gut microbiota influences the metabolic profile in regions distant from the gut such as the brain[26]. Moreover, it releases factors that target specific neuronal systems involved in the gut-brain axis, generating neurotransmitters and neuromodulators as dopamine, noradrenaline, acetylcholine and gamma-aminobutyric acid (GABA)[27-31]. Direct contact of certain probiotics (*i.e.*, L*actobacillus acidophilus*) with epithelial cells induce the expression of opioid and cannabinoid receptors in the gut and contribute to the modulation and restoration of the normal perception of visceral pain

1. Cryan JF, Dinan TG. Mind-altering microorganisms: the impact of the gut microbiota on brain and behaviour. Nat Rev Neurosci. 2012;13:701–712.

2. Lyte M. Probiotics function mechanistically as delivery vehicles for neuroactive compounds: Microbial endocrinology in the design and use of probiotics. Bioessays. 2011;33:574–581.

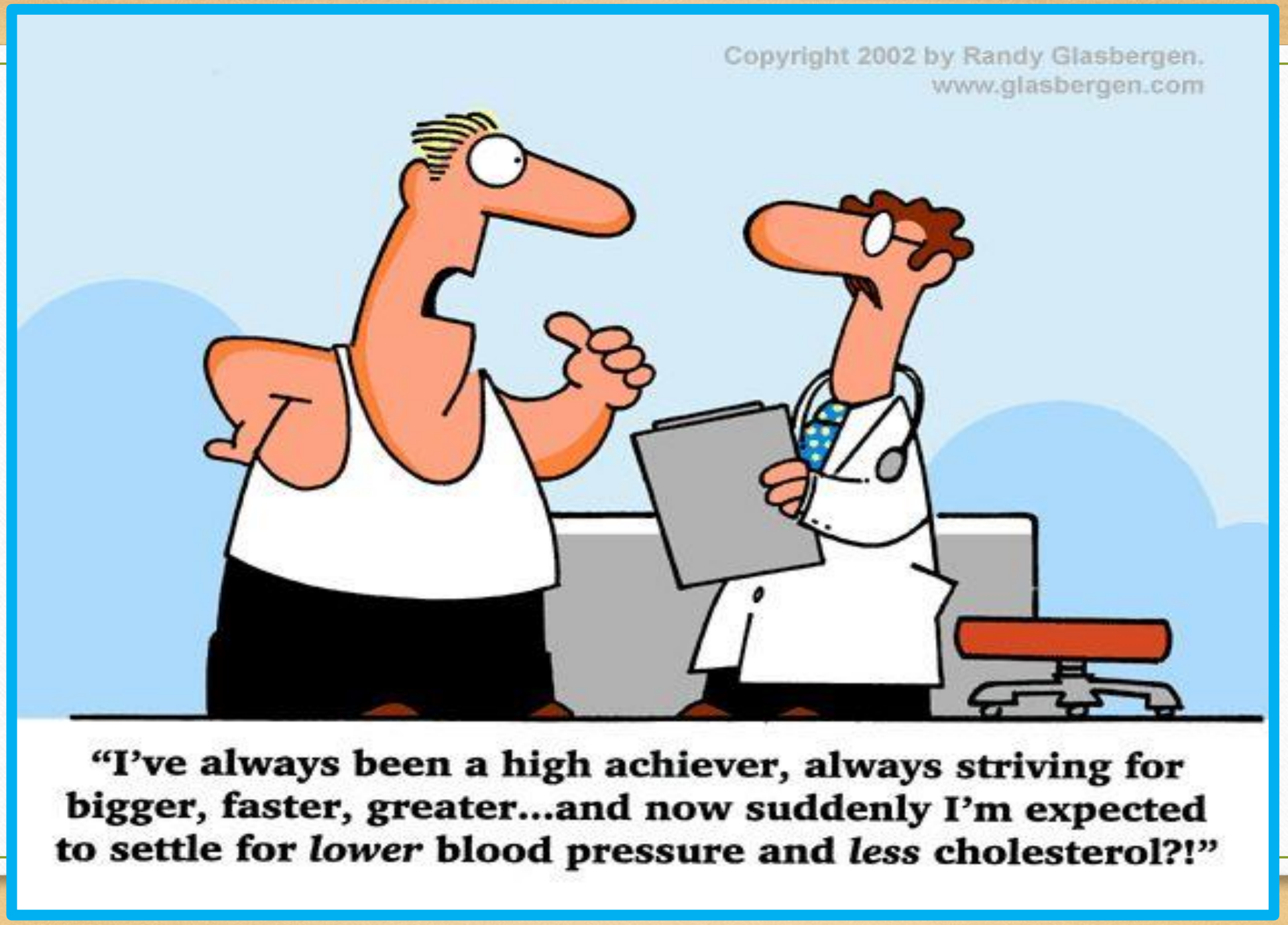
3. Forsythe P, Kunze WA. Voices from within: gut microbes and the CNS. Cell Mol Life Sci. 2013;70:55–69.

4. Asano Y, Hiramoto T, Nishino R, Aiba Y, Kimura T, Yoshihara K, Koga Y, Sudo N. Critical role of gut microbiota in the production of biologically active, free catecholamines in the gut lumen of mice. Am J Physiol Gastrointest Liver Physiol. 2012;303:G1288–G1295.

5. Barrett E, Ross RP, O'Toole PW, Fitzgerald GF, Stanton C. γ-Aminobutyric acid production by culturable bacteria from the human intestine. J Appl Microbiol. 2012;113:411–417

LOW SCFA

- Glutamine – promotes intestinal cell proliferation, →NFkB
- Probiotics
  - modulate the activity of many cells NKs, DCs, macrophages, epithelial cells and granulocytes, and Th1, Th2, Th17, Treg, Tc and B cells
  - Biotransformation, vitamin synthesis, peristalsis
- Prebiotics


Copyright 2002 by Randy Glasbergen.
www.glasbergen.com
"I've always been a high achiever, always striving for bigger, faster, greater...and now suddenly I'm expected to settle for *lower* blood pressure and *less* cholesterol?!"

PREBIOTIC FOODS

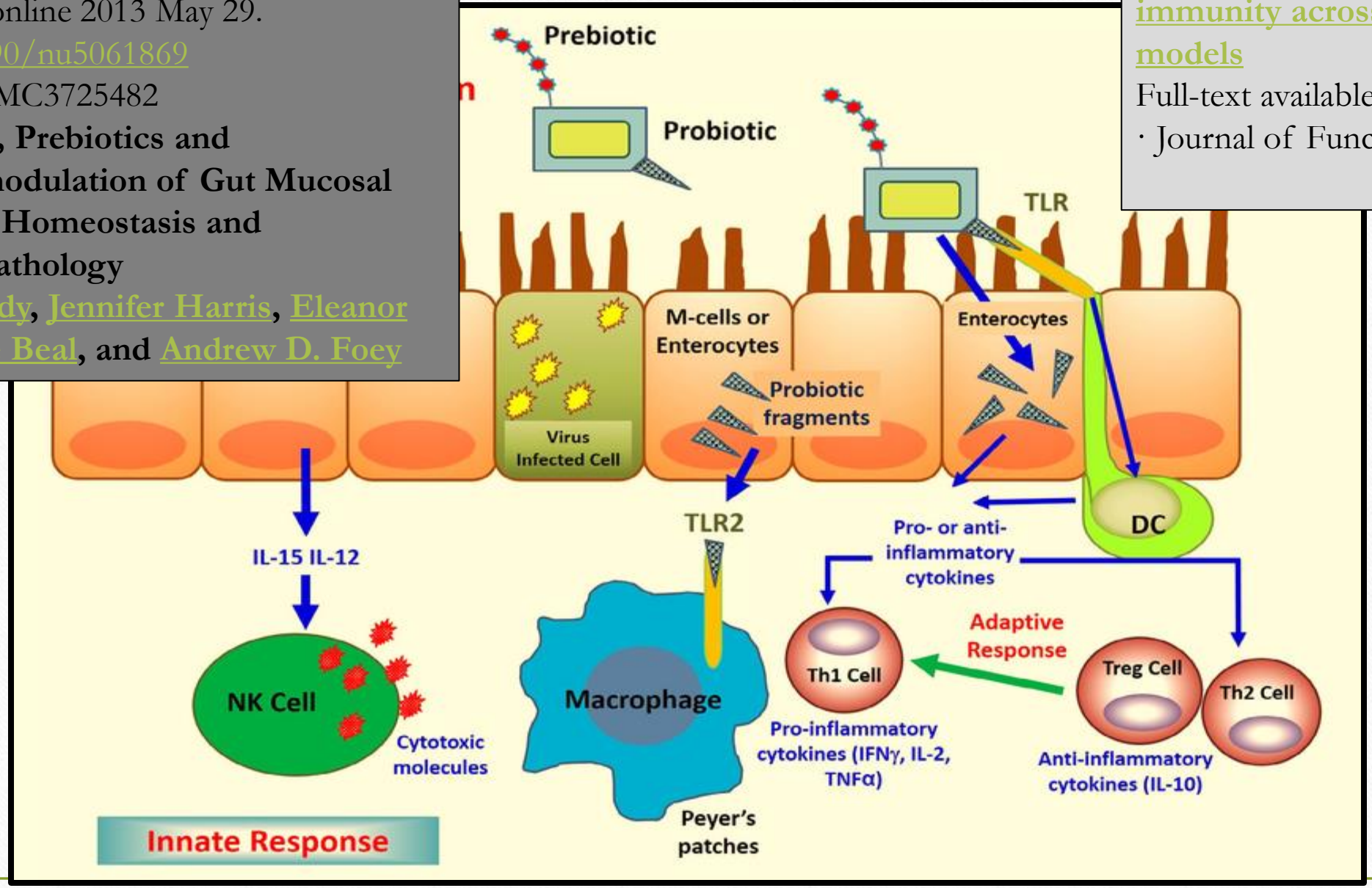
Nutrients. 2013 Jun; 5(6): 1869–1912.
Published online 2013 May 29.
doi: 10.3390/nu5061869
PMCID: PMC3725482

Probiotics, Prebiotics and Immunomodulation of Gut Mucosal Defences: Homeostasis and Immunopathology

Holly Hardy, Jennifer Harris, Eleanor Lyon, Jane Beal, and Andrew D. Foey

Probiotics in valorization of innate immunity across various animal models

Full-text available · Article · Mar 2015 · Journal of Functional Foods



Visit #3 (6 mths)

MSQ 22 (119) **PROMIS: PH 87% (7.2%)**

Gi effects retest ordered, Nutra Eval reordered

BM- daily (dairy constipates me)

Belching and reflux improved "a lot with Creon"

Muscle pain overall better – off the daily aleve

No more LUQ pain

And BTW…Psych is weaning me off the mood stablizer

Viscerosomatic Reflex