

Introduction To Anti-Inflammatory Nutrition



Why Do We Gain Weight, Get Sick, and Age Faster?



Chronic Diseases Associated With Excess Inflammation

- Obesity
- Metabolic Syndrome
- Type 2 Diabetes
- Heart Disease
- Cancer
- Neurological
 - Alzheimer's, Depression, ADHD, Parkinson's
- Auto-immune
 - Type 1 Diabetes, RA, Multiple Sclerosis
- Asthma
- Allergies
- Other inflammatory conditions (“itis”)



What Is Inflammation?

- **Ancient Greeks**
 - Internal Fire
- **Ancient Romans**
 - Heat
 - Pain
 - Swelling
 - Redness



What Is Inflammation?

- Complex orchestration of pro-inflammatory and anti-inflammatory events
- Usually associated with pain
- Mediated by eicosanoids
- Treated by drugs that alter eicosanoids
 - Aspirin
 - NSAID's
 - COX-2 inhibitors
 - Steroids



But You Need A Zone

- Too little of an inflammatory response
 - Sitting target for microbes
 - Injuries never heal
- Too much of an inflammatory response
 - The body attacks itself

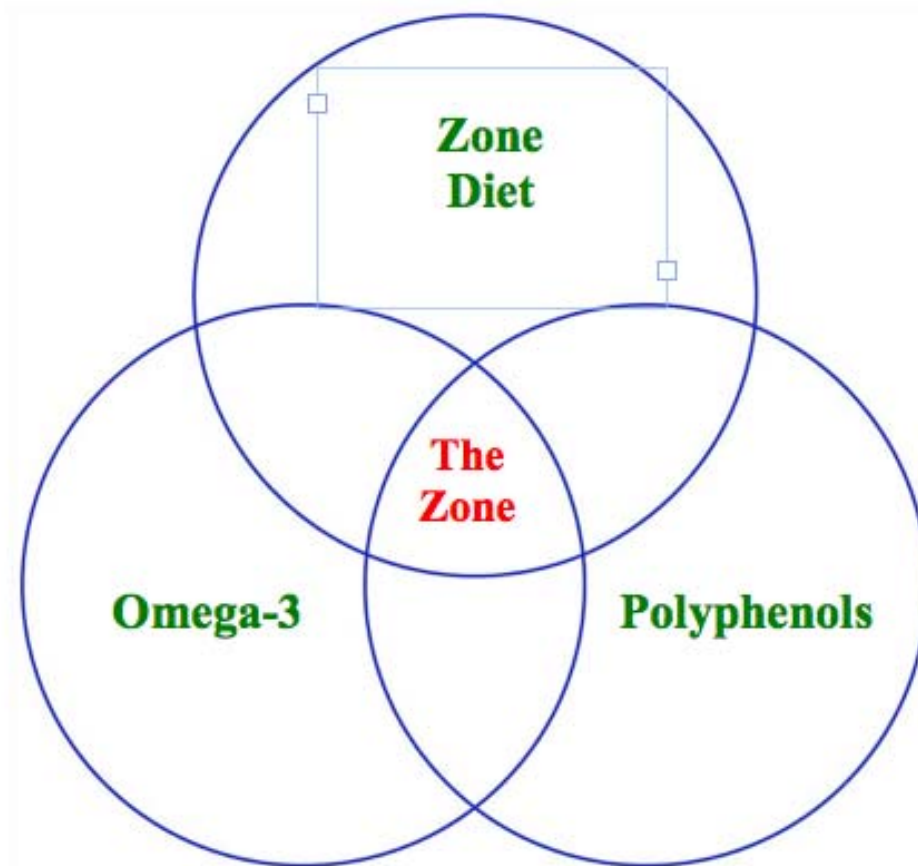


Events That Turn On Inflammatory Responses

- Microbial invasion
- Injuries
- Diet



Overview Of Anti-Inflammatory Nutrition



The Science Of The Zone

- Improved hormonal control
- Resolution of inflammation
- Control of gene expression



Unique Roles For Each Dietary Intervention

- Zone Diet
 - Reduction of the initiation of inflammation
- Omega-3 Fatty Acids
 - Acceleration of the resolution of inflammation
- Polyphenols
 - Slowing of the aging process




Benefits Of Being In The Zone

- Reduce the likelihood of chronic disease
- Slow the rate of aging
- Defines the clinical markers of wellness



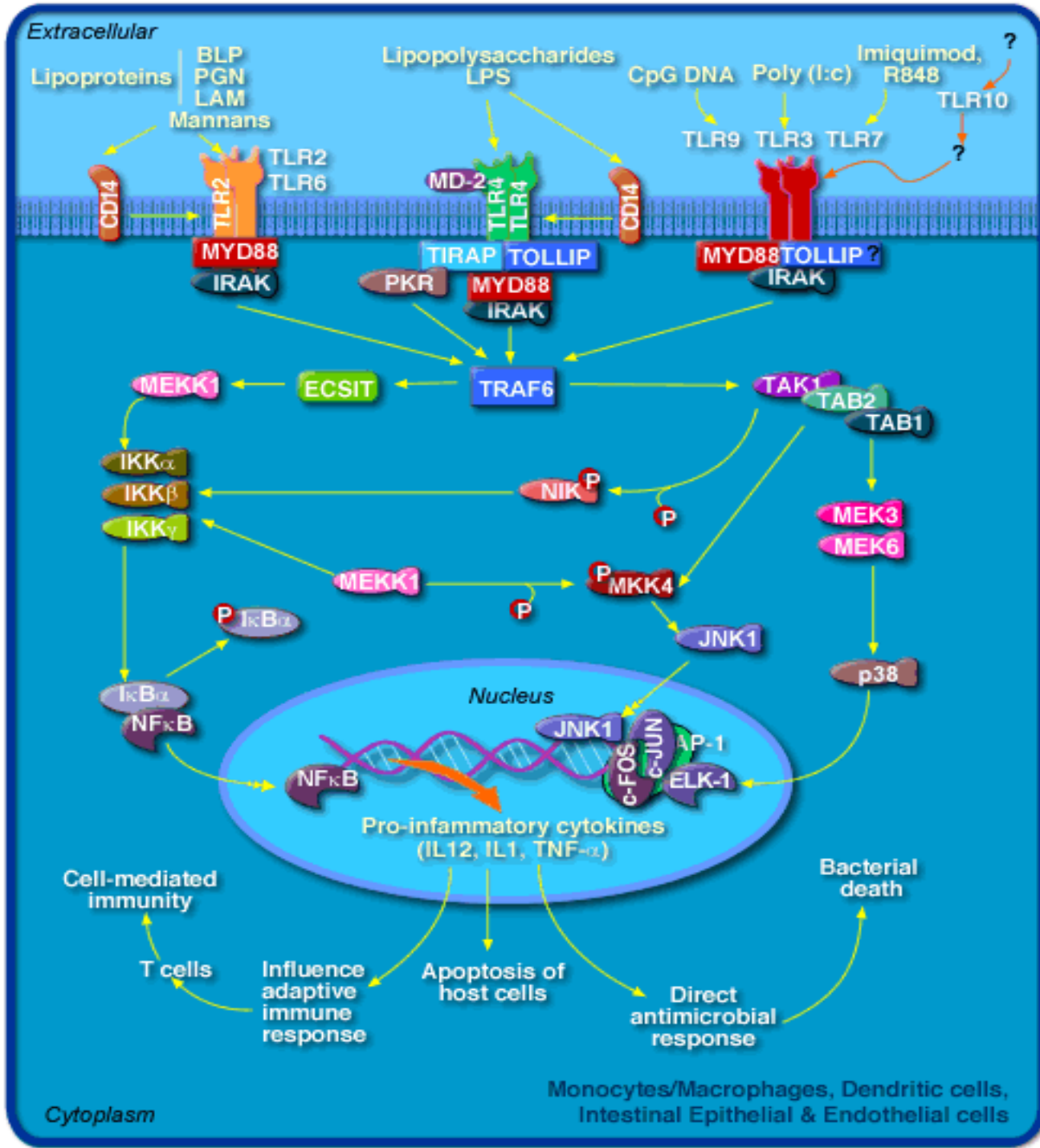
Clinical Markers That Define The Zone

- **AA/EPA ratio**
 - Marker of inflammation
 - Maintain between 1.5 and 3
 - **TG/HDL ratio**
 - Marker of insulin resistance
 - <1 (mg/dl) or <0.4 (mmol/l)
 - **HbA₁C**
 - Marker of long-term glycemic control
 - 5%
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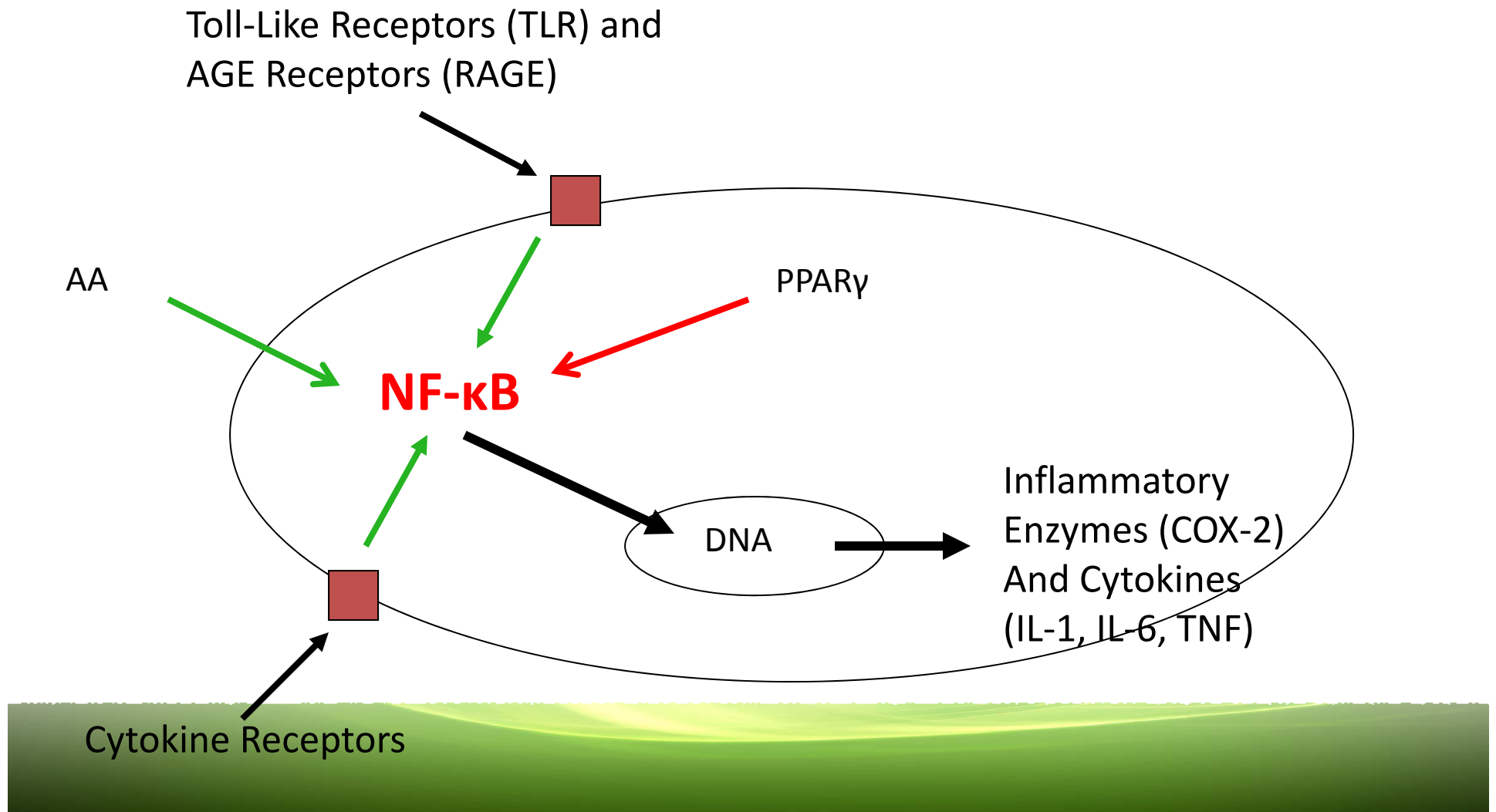
Our Two Immune Systems

- Innate (Strongly affected by the diet)
 - Primitive
 - Early response
 - Based on pattern recognition
- Adaptive (Weakly affected by the diet)
 - More advanced
 - Slowly responding
 - Based on memory

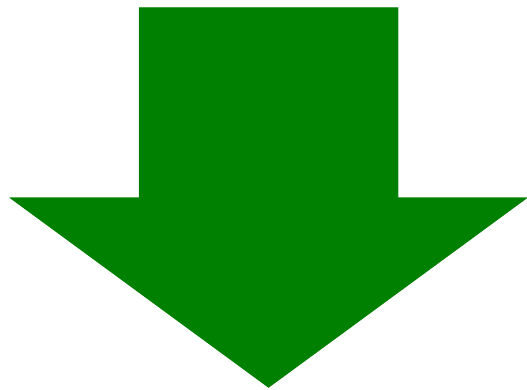




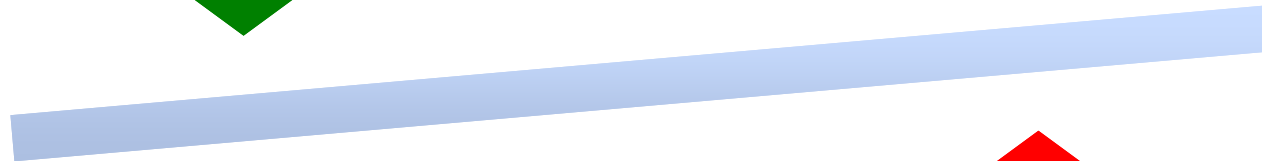
Innate Immune System Made Simple



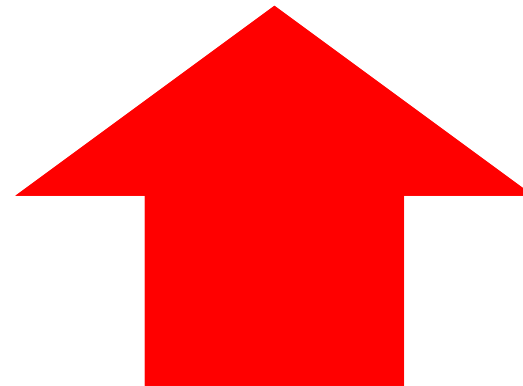
Dietary Controls on NF- κ B Activity



Omega-6 Fatty
Acids, Saturated
Fatty Acids, Excess
Carbs ,and Excess
Calories



Zone Diet, Omega-3
Fatty Acids, and
Polyphenols



Phases Of Inflammation

Initiating Event



Pro-inflammatory Initiation Response
Cellular Destruction



Anti-Inflammatory Resolution Response
Cellular Rejuvenation



What Is Cellular Inflammation?

- Mismatch between the initiation and resolution of inflammation
- Chronic activation of innate immune system
- Inflammation below the perception of pain



What Causes Cellular Inflammation?



The Perfect Nutritional Storm

- Increased Omega-6 Consumption
- Increased Refined Carbohydrate Consumption
- Decreased Omega-3 Consumption
- Decreased Polyphenol Consumption



How It Happens

Omega-6 Fatty Acids

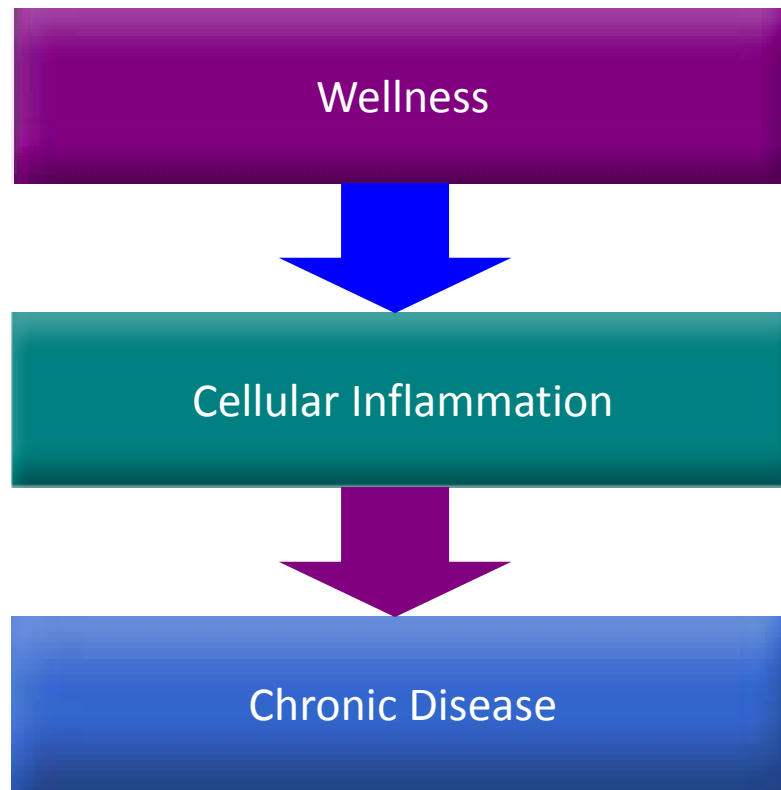
*Activated by Insulin
Inhibited by Omega-3 Fats*

Arachidonic Acid

Cellular
Inflammation



Three Stages Of Disease



**The Best Way
To Reach the Zone Is
Through The Anti-
Inflammatory
Zone Diet**



Anti-Inflammatory Supplements For The Anti-Inflammatory Zone Diet:

Fish Oil and Polyphenols




Omega-3 Fatty Acids:

Putting Out the Inflammatory Fire



Clinical Benefits Of High-Dose Fish Oil

- Heart Disease
 - Cancer
 - Depression
 - Attention Deficit Disorder
 - Multiple Sclerosis
 - Brain Trauma
 - Alzheimer's
 - Chronic Pain
 - Osteoporosis
 - Skin Disorders
 - Fertility
 - Fat Loss
- 

Polyphenols:

*The Color of Anti-Inflammation
Nutrition*



Mechanisms Of Action

- Anti-oxidants
- Anti-inflammatory
- Anti-aging

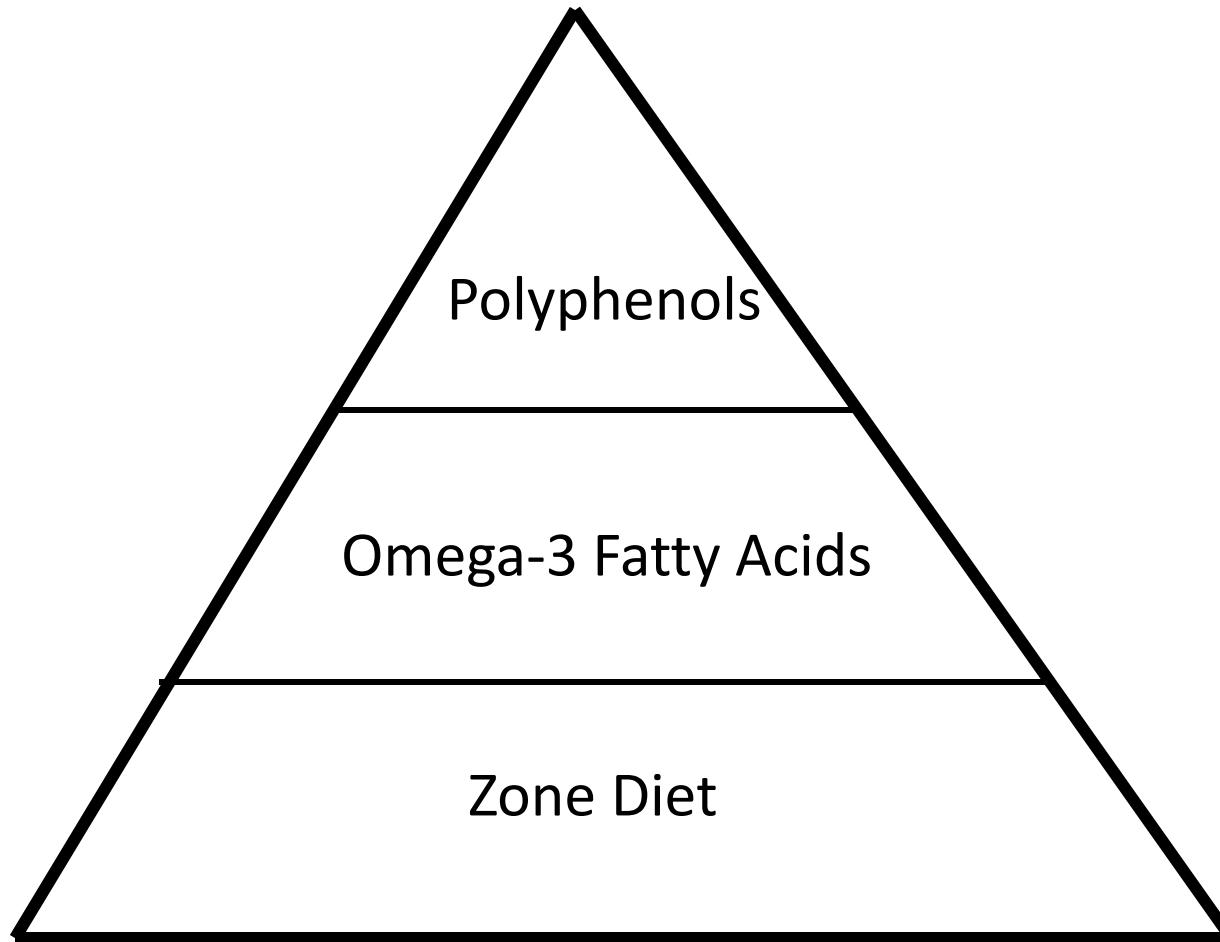


A New Powerful Message

- Diet can *turn on* inflammatory genes
- Diet can *turn off* inflammatory genes



Treating Nutrition As Gene Therapy



INFLAMMATORY GENES

Why Anti-Inflammatory Nutrition Is Important

Cellular
Inflammation

Obesity

Diabetes

Alzheimer's



The Zone Diet

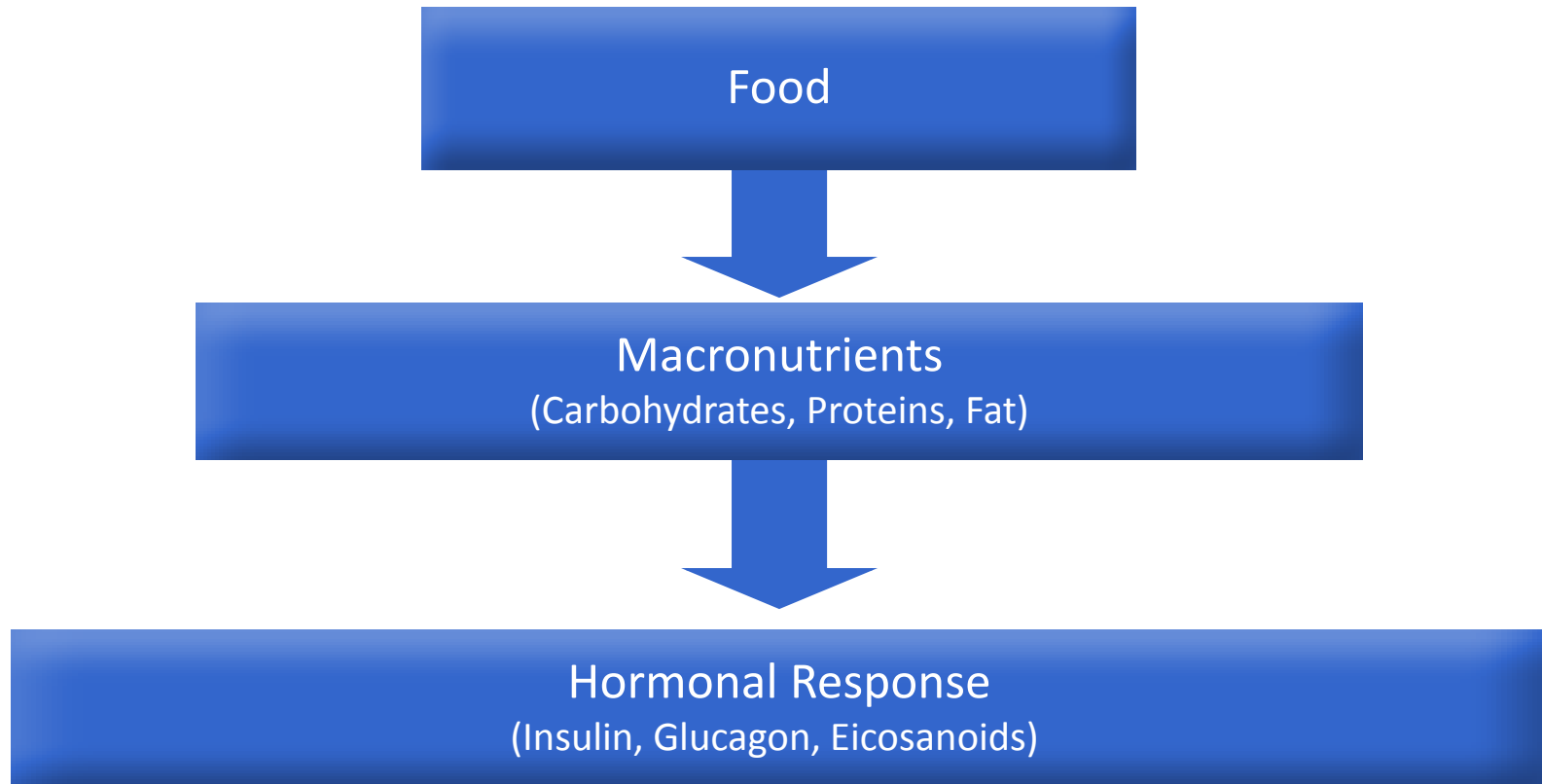


Beginnings Of The Zone Diet

- Epidemiological studies of Greenland Eskimos (mid-1970s)
 - Little heart disease, cancer, depression, multiple sclerosis, etc.
 - Diet rich in omega-3 fatty acids
- 1982 Nobel Prize in Medicine
 - Role of eicosanoids in inflammation



Food As A Drug



Insulin

Storage Hormone



Eicosanoids

Master Hormone

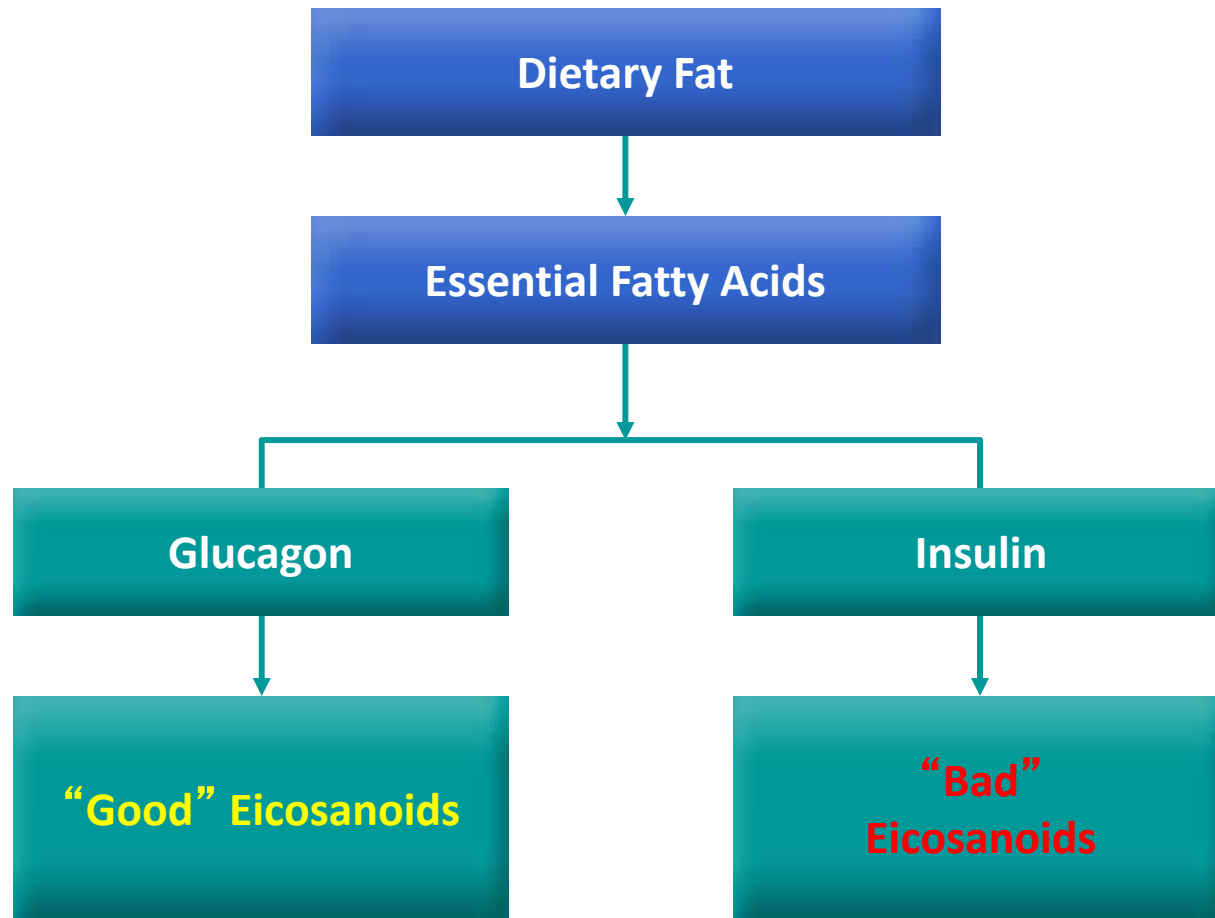


Glucagon

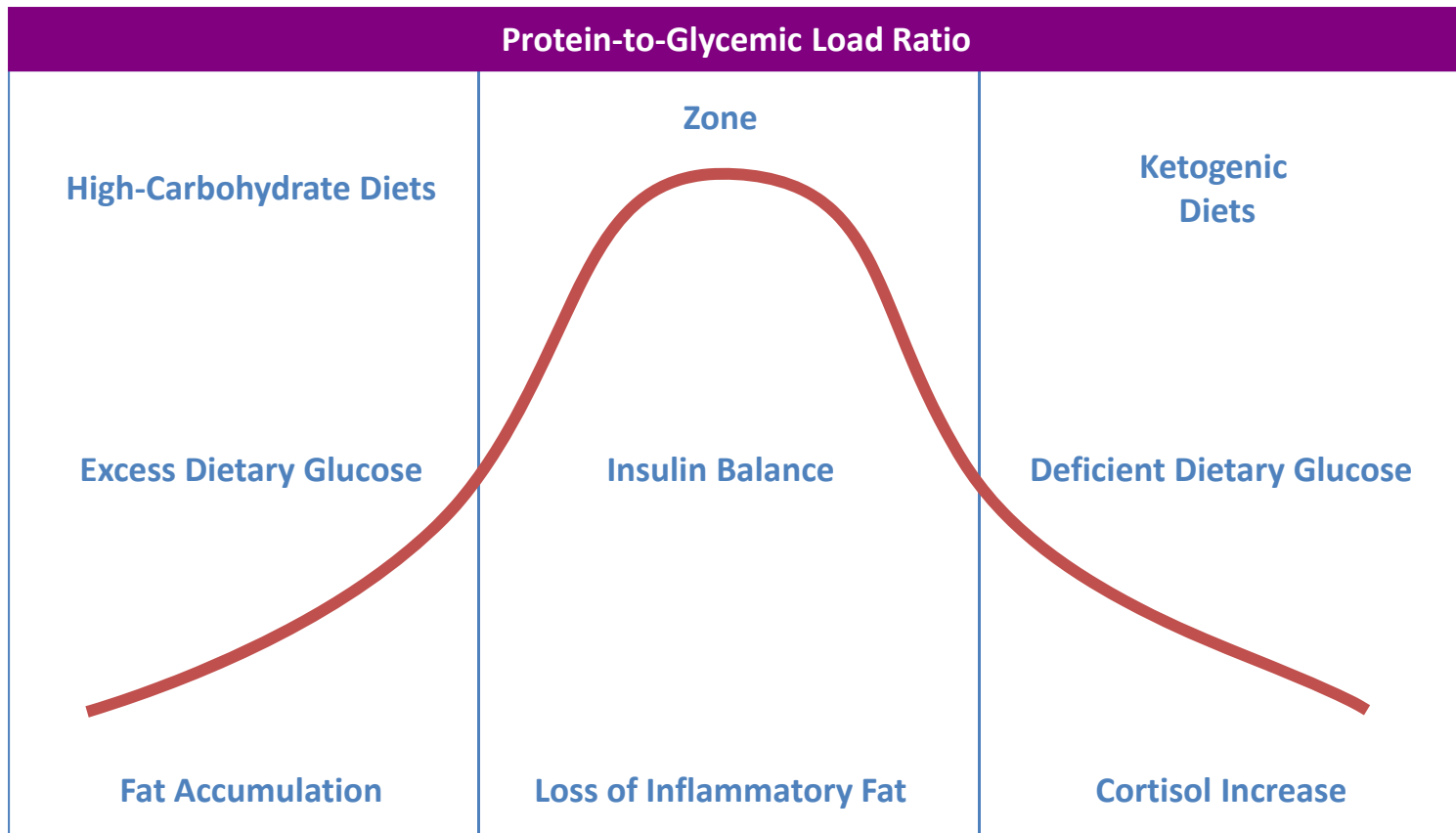
Mobilization Hormone



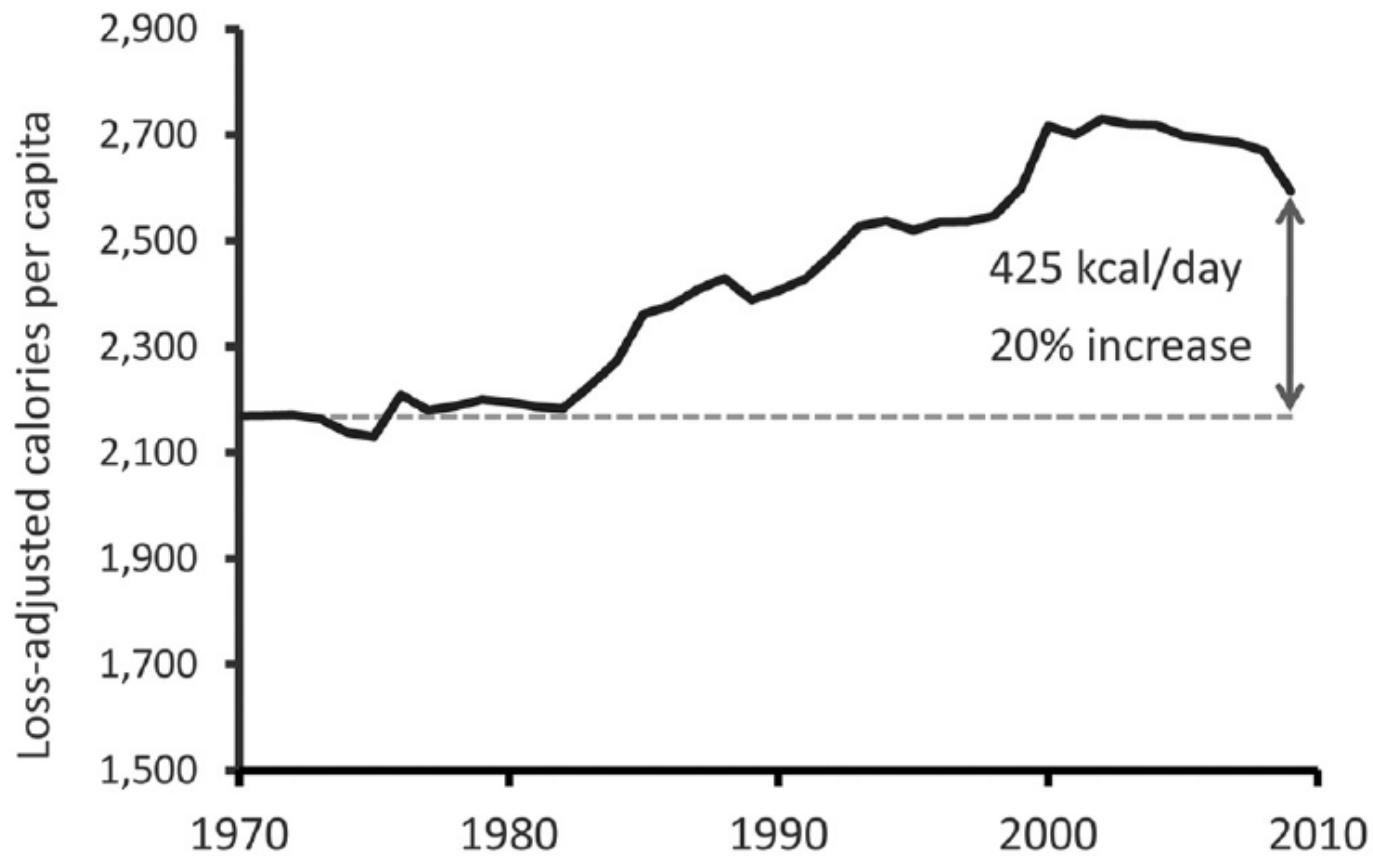
Eicosanoids Are Controlled By Dietary Fat And Insulin



The Zone Diet is Based Upon on The Balance of the Protein-to- Glycemic Load



How We Get Fat



Why Not Eat Less, Exercise More?

- Eating less increases biological defense mechanisms that increases *hunger*
- Exercising more increases *hunger*



Why Are We Fatter?



Dietary “Answers” In The Early 1990s

- Fat makes you fat
 - If no fat touches your lips, no fat reaches your hips
 - Can eat more food, and not gain weight
 - Ornish diet (very-low fat diet)
- Carbs makes you fat
 - Replace carbs with even more fat
 - Can eat more food and not gain weight
 - Atkins diet (ketogenic diet)



What Is Metabolism?

- Conversion of dietary calories into chemical energy (ATP)
- Fat is high-octane fuel for ATP production
- The Fat Trap
 - Excess dietary calories get trapped in your fat cells and can't get out to be converted into ATP



What Causes A Fat Trap?

Diet



Inflammation



Insulin Resistance



Fat Trap



A Third Choice Appears In 1995

- Inflammation makes you fat
 - Blood, brain, and the gut
 - Have to reduce calories, but without hunger or fatigue
 - Zone Diet



Zone Diet

Recommendations (1995)

- 40% low-glycemic load carbs
- 30% low-fat protein
- 30% monounsaturated fat, but low in omega-6 and saturated fats
- 1,200 to 1,500 calories per day



Dietary Guidelines From The Joslin Diabetes Research Center At Harvard (2007)

- 40% low glycemic load carbs
- 20-30% low-fat protein
- 30-40% monounsaturated fat
- 1,200 to 1,500 calories per day



Per Cent Calories On A 40-30-30 Dietary Balance Can Be Deceiving

Macronutrient	1,200 calories/day	1,500 calories/day
Carbohydrate	120 g/day	150 g/day
Protein	90 g/day	112 g/day
Fat	40 g/day	50 g/day

What 1,200 Calories Per Day Represents On The Zone Diet

- *Carbohydrates (120 grams)*
 - 8 servings (500 g or 4 cups) of cooked vegetables
 - 2 servings (200 g or 1 cup) of fresh fruit
 - 1 serving each of lentils (1/2 cup) and oatmeal (1/2 cup)
 - Provides >40 grams of total fiber
- *Protein (90 grams)*
 - Low-fat protein sources
- *Fat (40 grams)*
 - 2 tablespoons of extra virgin olive oil

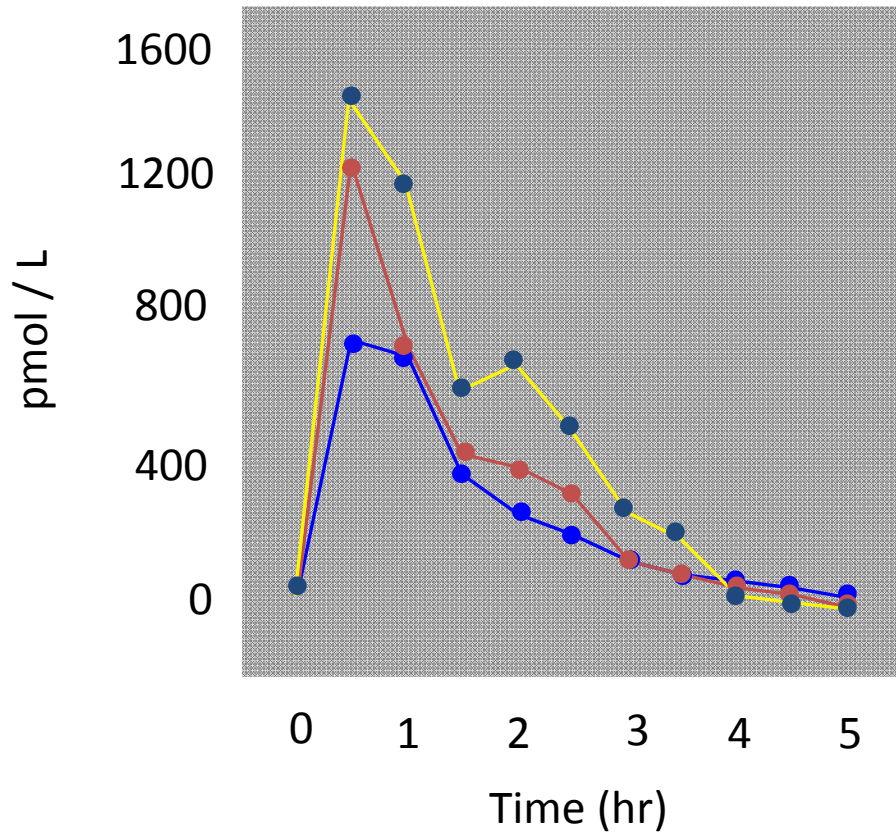


Zone Diet and Hormonal Balance

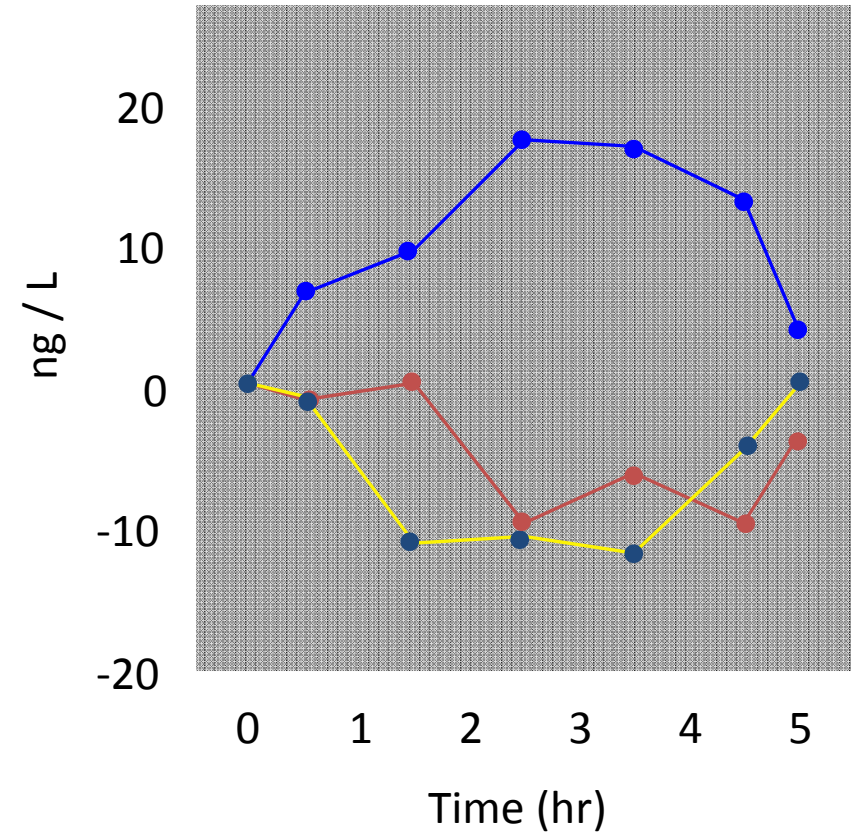


Zone Diet Induces Rapid Changes in Hormonal Responses

Serum Insulin (change)



Plasma Glucagon (change)



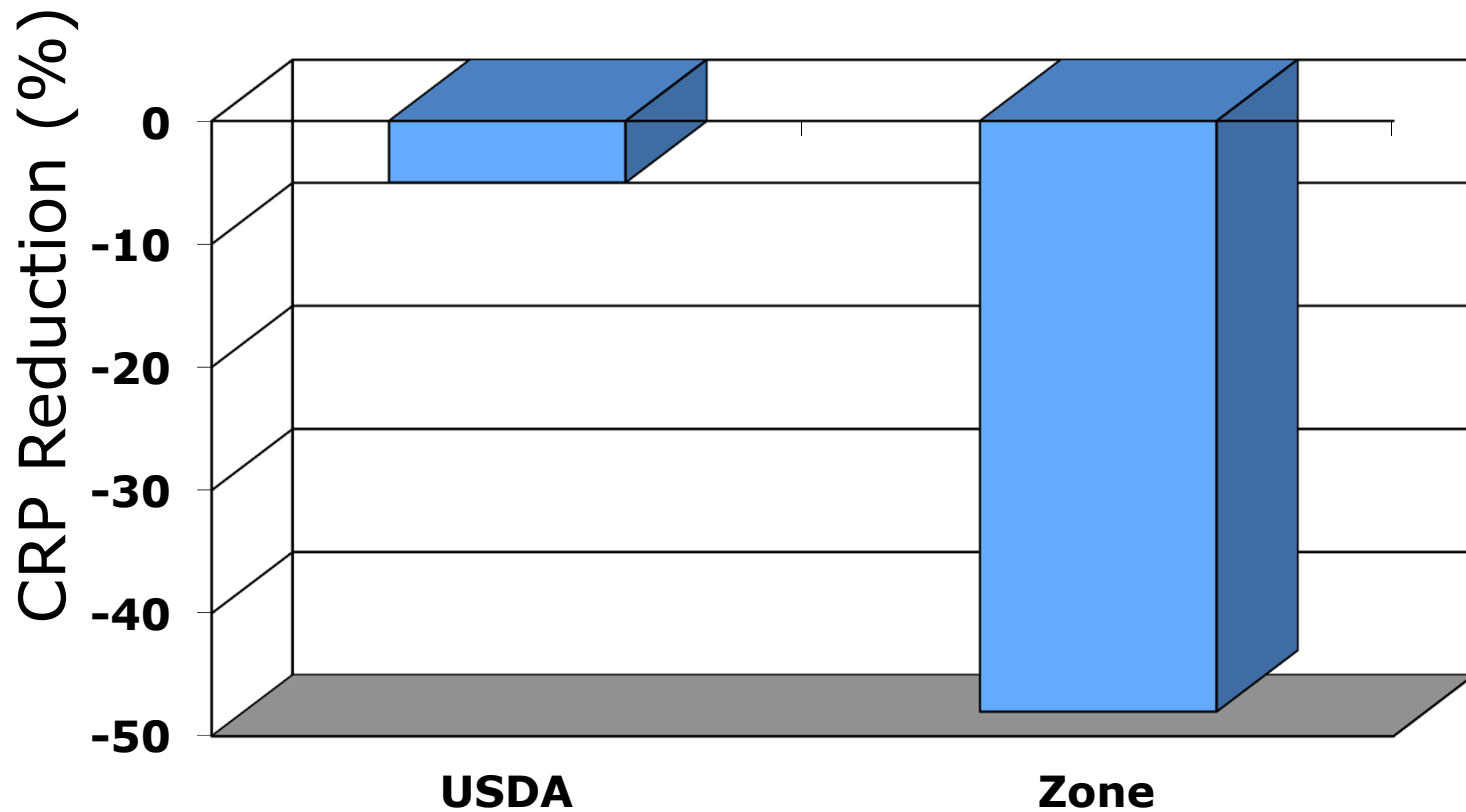
- High Carbohydrate, High Glycemic Load Meal
- High Carbohydrate, Lower Glycemic Load Meal
- Zone Meal

Ludwig et al. Pediatrics 103:e26 (1999)

Zone Diet and Reduction of Inflammation



The Zone Diet Reduces Cellular Inflammation

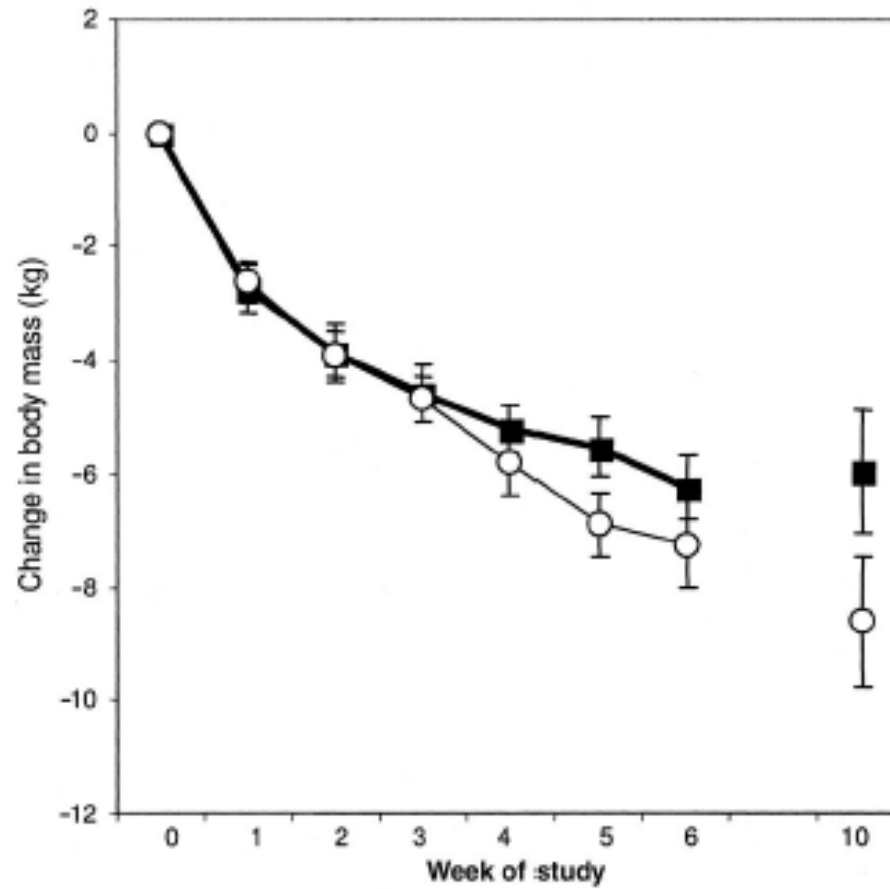


Pereira et al. JAMA 292: 2482 (2004)

The Zone
vs.
Ketogenic Diets

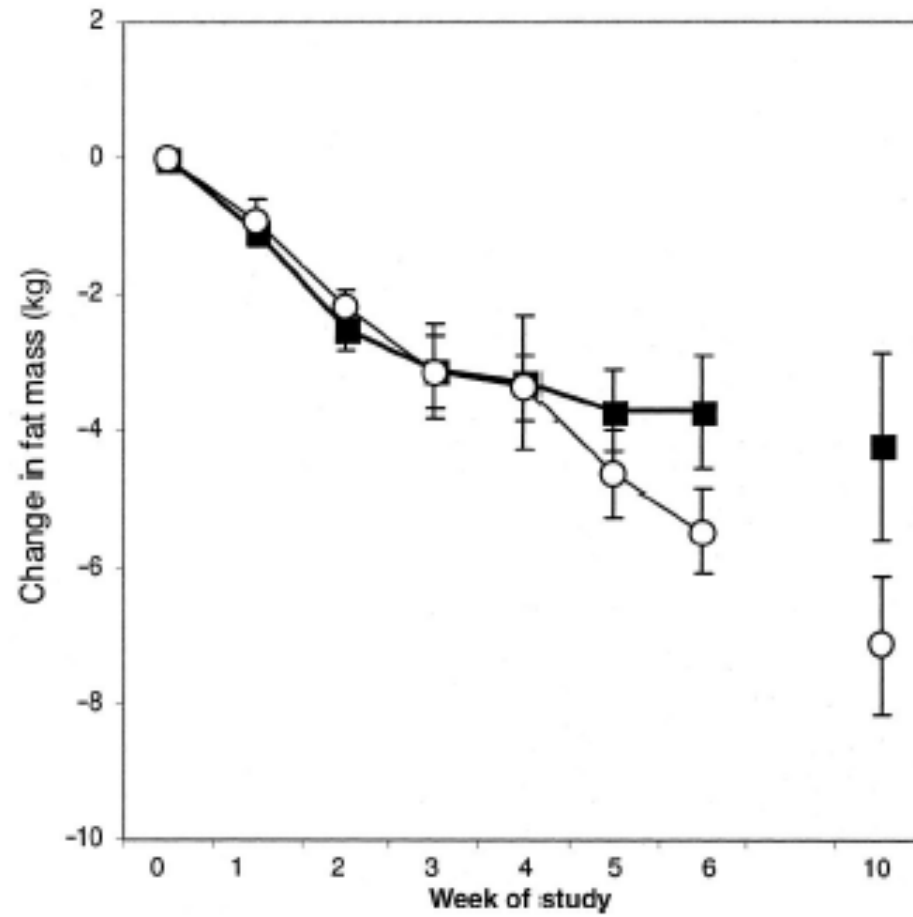


Weight Loss



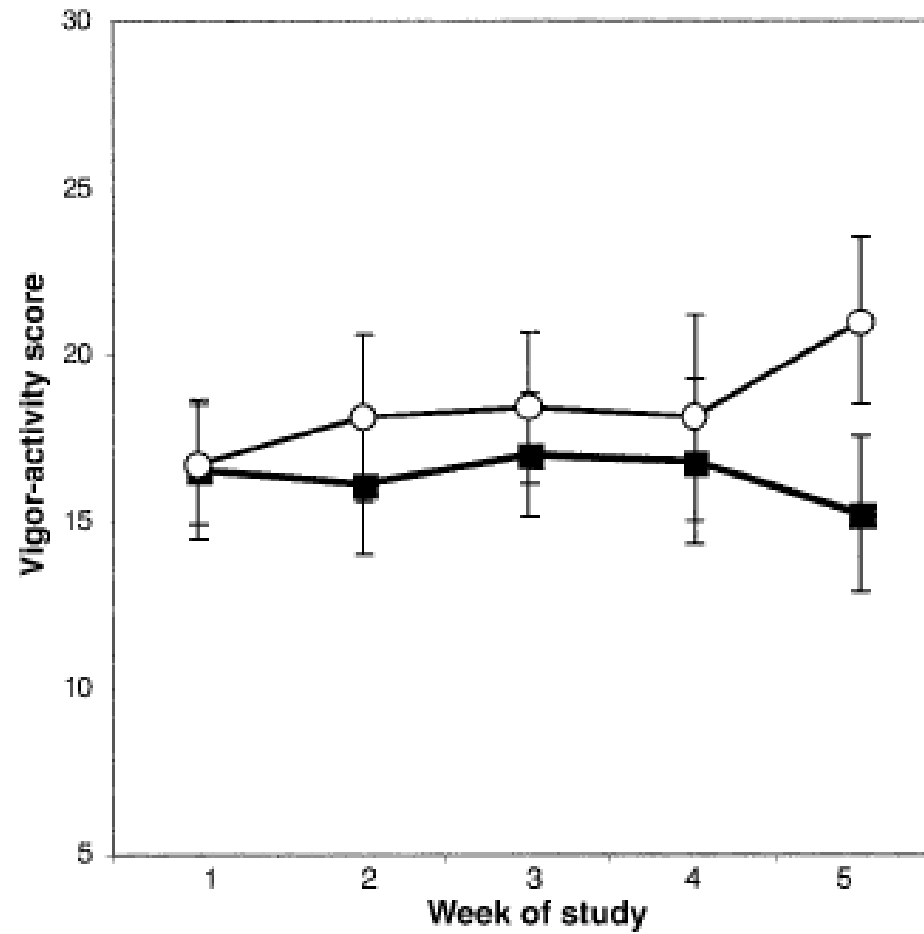
Johnston et al AJCN 83:1055 (2006)

Fat Loss



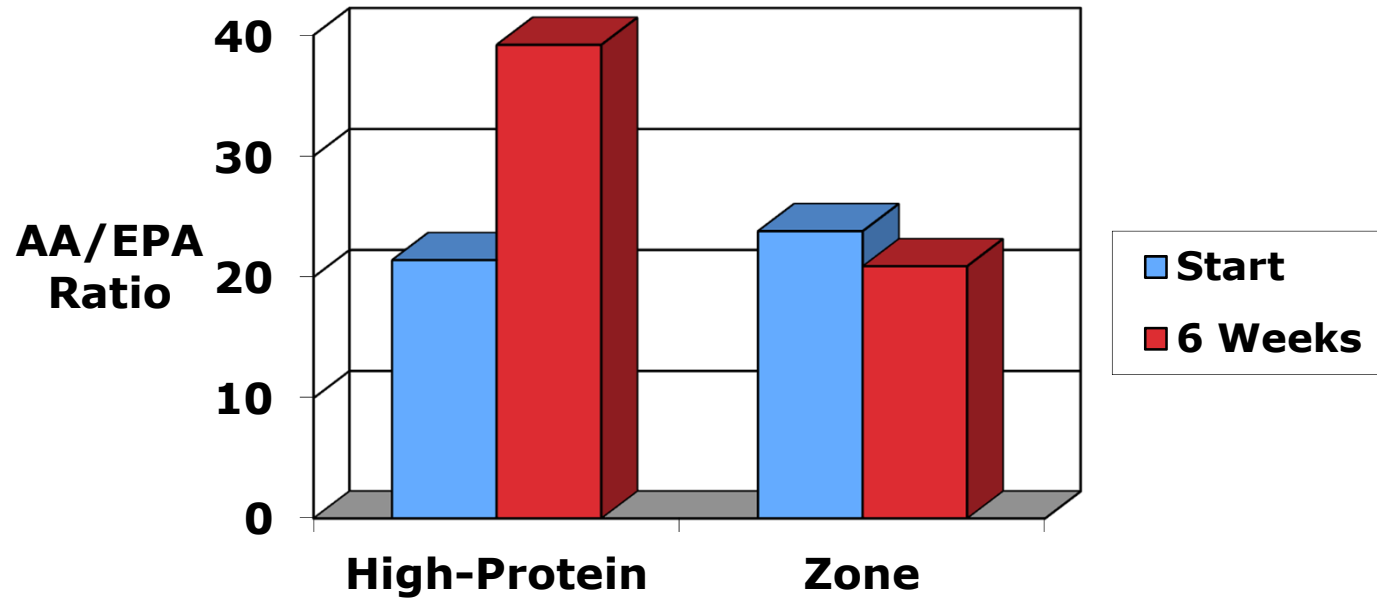
Johnston et al AJCN 83:1055 (2006)

Energy



Johnston et al AJCN 83:1055 (2006)

Ketogenic Diets Increase Cellular Inflammation



Johnston et al AJCN 83: 1055 (2006)

Metabolic Changes On A Ketogenic Diet

- 18% increase in cortisol levels
- 12% decrease in T₃ levels

Ebbeling et al. JAMA 307:267 (2012)



Key Points Of The Zone Diet

- Calories do count
- You need adequate protein
- Balance your plate to balance your hormones
- Reduce omega-6 and saturated fat
- Consume colorful carbs
- Fermentable fiber is important



**Reducing Insulin
Resistance Is The Key
Benefit Of The
Zone Diet**



What Is Insulin Resistance?

- Inability to transmit insulin signal to interior of the cell
- Hormonal communication is garbled
- Caused by increased inflammation
- Insulin is the central point for metabolism



Insulin Resistance Is Highly Organ Dependent



Hypothalamus

- Balances of energy intake and expenditure
 - Satiety signals from gut matched to hormonal signals (leptin and insulin) from the blood
- Sensitive to excess calories and saturated fats
 - ER stress and inflammation



Hypothalamic Inflammation Is Rapid

- Within 24 hours of HFD
- Precedes any weight gain
- Fatty acid sensors
 - Palmitic acid and TLR-4 receptors
 - Pro-inflammatory
 - Omega-3 and oleic acids
 - Anti-inflammatory



Liver

- Can start earlier than adipose tissue
 - 3 days after HFD
 - Connection to hypothalamus via vagus nerve
- Increase in cholesterol levels
- Development of fatty liver
 - 25% of all Americans
 - 90% of type 2 diabetics



Adipose Tissue

- Expansion of existing fat cells
- Hypoxia of expanded fat cells
- Healthy fat cells turning sick and then dying creating more inflammation



Muscle

- Primary site for glucose uptake
- Inflammatory cytokines from adipose tissue and liver disrupt glucose uptake



Zone Diet: An Anti-Inflammatory Diet


Key Aspects:

- Based on the glycemic load
- Balance of protein, carbohydrates, and fat

What's Driving Physician Interest:

- Diet without hunger and fatigue
- Flexibility
- Moderate approach

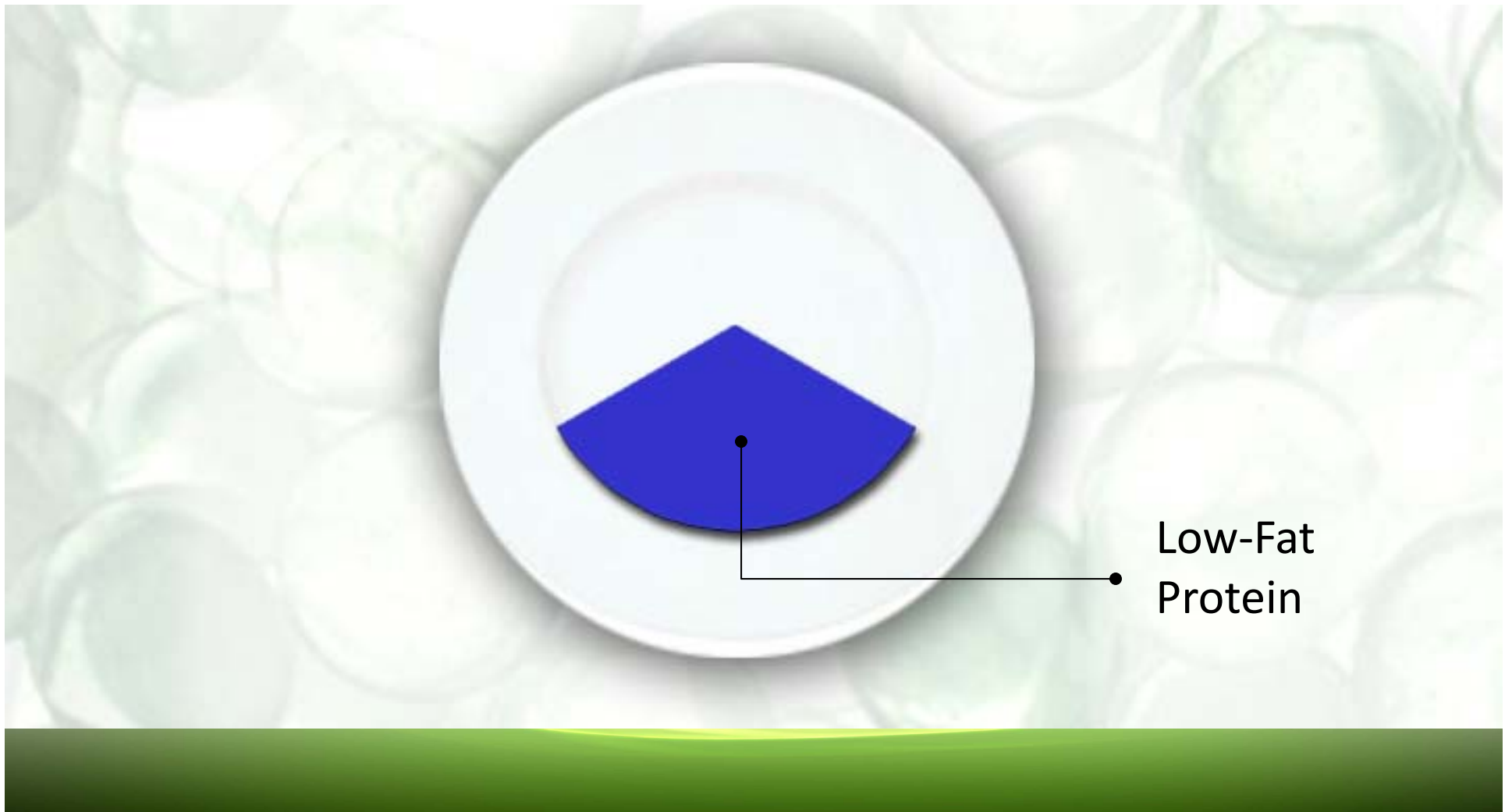
Implications:

- Long-term compliance
 - Medically validated
- 

How Difficult Is To Follow The Zone Diet?

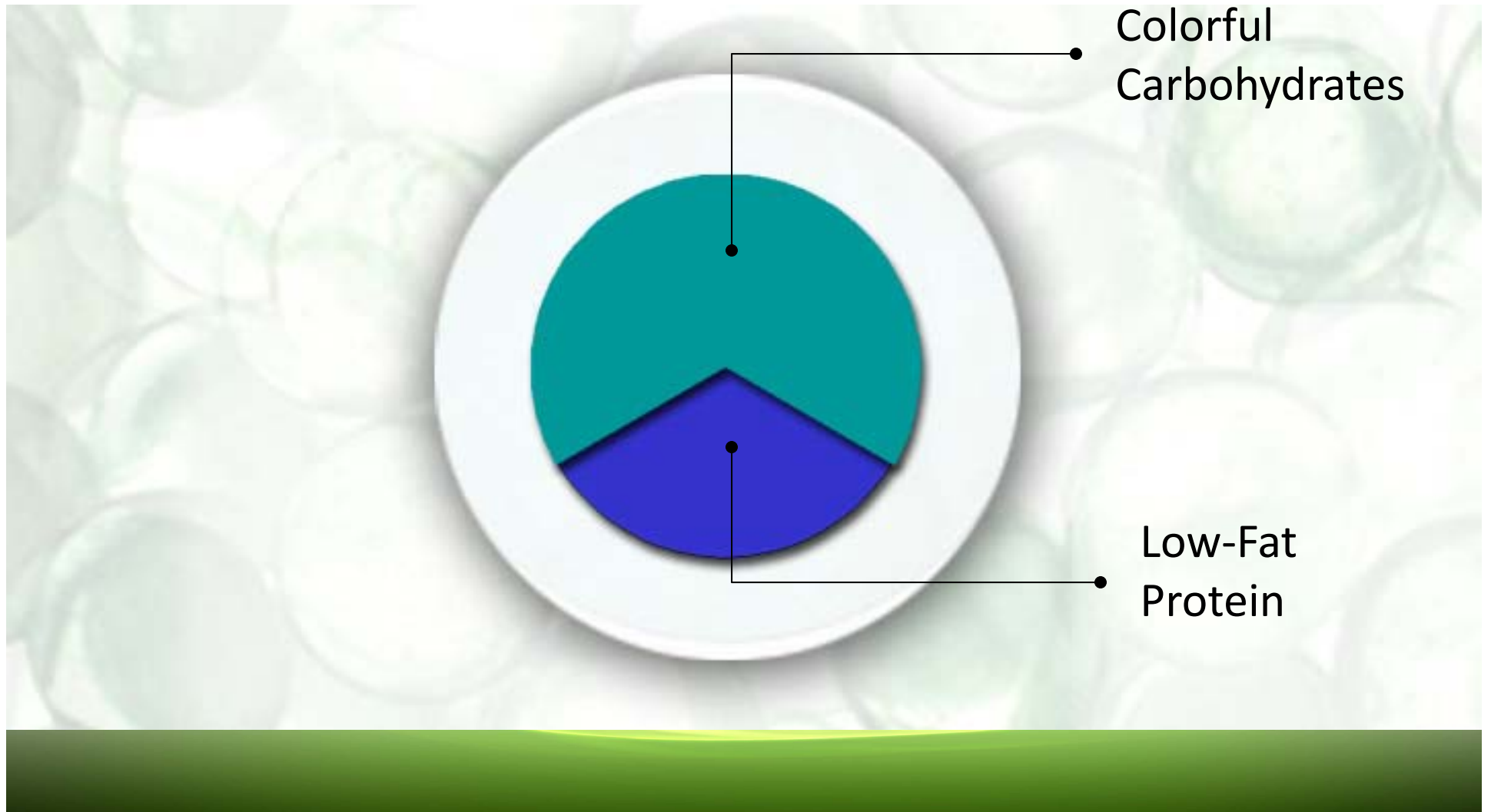


Start With:



Low-Fat
Protein

Balance With:



Finally Add Fat!

Good Choices

- **Low in Omega-6 and Saturated Fats**

Extremely Bad Choices

- **High in Omega-6 Fats**
-



Grains and Starches
(Use in Moderation)



Monounsaturated Fat



Low-fat Protein



Fruits




Vegetables



Zone Food Pyramid

The Zone Diet Is A Blueprint For Hormonal Balance, Not A Philosophy

- *Vegan Zone*
 - No animal protein, no dairy or egg protein
 - *Lacto-ovo Vegetarian Zone*
 - No animal protein
 - *Paleo Zone*
 - No legumes, no dairy protein
 - *Omnivore Zone*
 - No restrictions on protein sources
- 

The Zone Diet Is The Evolution Of The Mediterranean Diet

- It's Mediterranean ingredients with the Zone blueprint for hormonal balance
- The more white you put on the plate, the more inflammation you create



Effect Of Diet On NF- κ B Activity In Humans

- High glycemic load diet increases NF- κ B activity

Dickinson et al AJCN 87:1188 (2008)



The Best Way To Reduce Cellular Inflammation

- Take omega-6 fats out of the diet
 - Reduce raw materials needed to produce arachidonic acid
- Reduce the use of high-glycemic carbs
 - Lower insulin making it more difficult to produce arachidonic acid from omega-6 fatty acids



What Can You Expect?

- **2-3 Days**
 - Lack of hunger
 - Better mental focus
- **3-4 Days**
 - Surge of physical energy
- **7 Days**
 - Clothes are fitting better
- **14 Days**
 - Better handling of stress
- **30 Days**
 - Greatly improved blood chemistry



Here's The Problem

- Omega-6 fatty acids are the most inexpensive calories in the world
- Refined carbohydrates are the foundation of processed foods
- It's easier to change your religion than to change your diet



An Alternative Way To Reduce Cellular Inflammation:

Anti-Inflammatory Supplements

