

KETO



**The science, physiology, and
practical application of ketogenic lifestyles**

Christopher Keroack, MD IFMCP

New England Center for Functional Medicine

All statements, content, clinical insights and experiences expressed in this presentation are solely those of the author and they should not be attributed, directly or indirectly, to Metagenics Institute

Patient and Provider

“Let food be thy medicine and medicine be thy food.”

– Hippocrates

FOOD

&

“There are in fact two things, science and opinion; the former begets knowledge, the latter ignorance.”

– Hippocrates

SCIENCE

Change my life to improve my health

- Get in Shape
- Lose Weight
- Spend Less / Save More
- Spend more time with family and friends
- Get Organized
- Learn something new
- Travel More
- Break my Iphone addiction
- Eat at home more
- Drink Less
- Stop Smoking
- Reduce Stress
- Get more Sleep
- Floss Regularly

Top 5 reasons we see a Chiropractor



1. Back Pain- relief and prevention

- Consumer Reports rated Chiropractic the #1 solution to lower back pain.
- Patients seeking chiropractic care for low back pain get relief faster and the results last longer.

2. Neck Pain- relief and prevention

- Chiropractic's history with neck pain is as impressive as with lower back pain.

3. Pain, Tingling and/or Numbness in an Extremity

- Patients who are suffering with Sciatica(in legs or feet), or a Cervical Radiculopathy(in arm or hand) usually seek medical intervention first due to the pain and discomfort. They eventually find their way to the chiropractor after these methods fail and the only other alternative is surgery.

4. Headaches/ Migraines- relief and prevention

- Chiropractic does not treat headaches. The Adjustments remove pressure off of nerves and allow the entire body to function better. As a result, many headaches tend to dissipate or even disappear.

5. Easier Pregnancy and Labor

- Moms-to-be have been finding relief at the chiropractor for all sorts of common issues during pregnancy.

Top 5 reasons we see a Naturopathic Doctor

1. Weight Loss

- Partially because of our diets/ partially because of our toxic load and exposure, healthy weight can prove to be challenging to the average consumer.

2. Thyroid/ Hormone Imbalances

- Many people, as a result of our various endotoxins, struggle with a variety of symptoms that can be traced back to difficulty with cortisol, thyroid and testosterone/estrogen. We first address this within the body in order to find the body's ability to heal itself. It may also be necessary to look to genetic variants to uncover why the body is taking on these toxins and not clearing them.

3. Autism/ADD/ADHD

- Just as sensitive people are they tend to have effects of the environment even more than their non-diagnosed counterpart. Since our world is increasingly sensitive to the various toxins, the neurological takes on the brunt of the toxic load with these patients.

4. Eczema, Psoriasis, or Various Skin Disorders Skin disorders

- Many people are challenged with these skin conditions that prove to be difficult to overcome. The skin is an expressive organ system, so it shows what is going on internally with a patient's health.

5. Digestive complaints

- This can occur when a patient's symptoms and signs don't match any typical western medicine diagnosis. After seeing digestive specialists , they often seek a holistic perspective.

Top 5 reasons we see a Medical Doctor

A photograph of a male medical professional in a white lab coat with a stethoscope around his neck, leaning over and talking to an elderly woman with short grey hair and glasses. She is sitting on a hospital bed, holding a folder. The background shows a hospital room with a framed picture on the wall.

1. **Skin disorders**

- Including cysts, acne and dermatitis.

2. **Back and Joint disorders**

- Especially osteoarthritis

3. **Cardio-metabolic Disease**

- Cholesterol problems, High Blood Pressure and Diabetes.

4. **Upper respiratory conditions**


- Cough and Breathing disorders/Shortness of Breath

5. **Chronic neurologic disorders**

- Anxiety, bipolar disorder and depression
- Headaches and Migraines

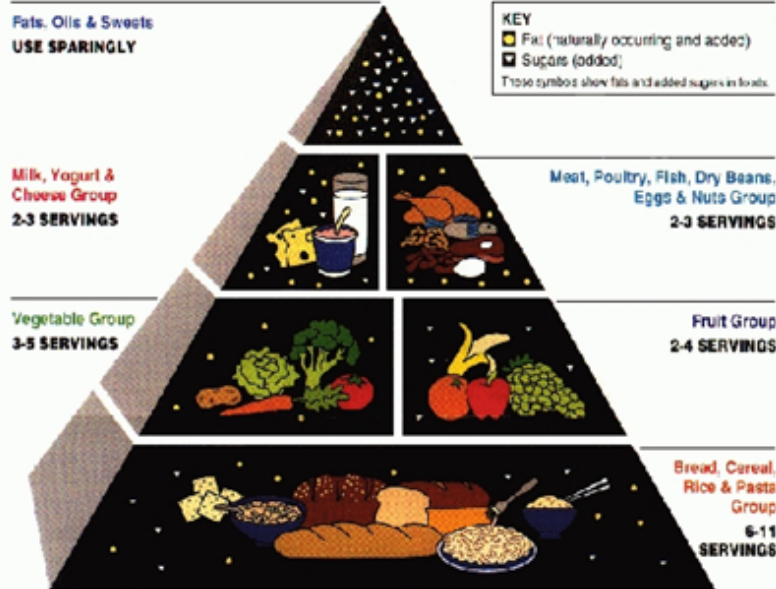


5 major factors influencing our health

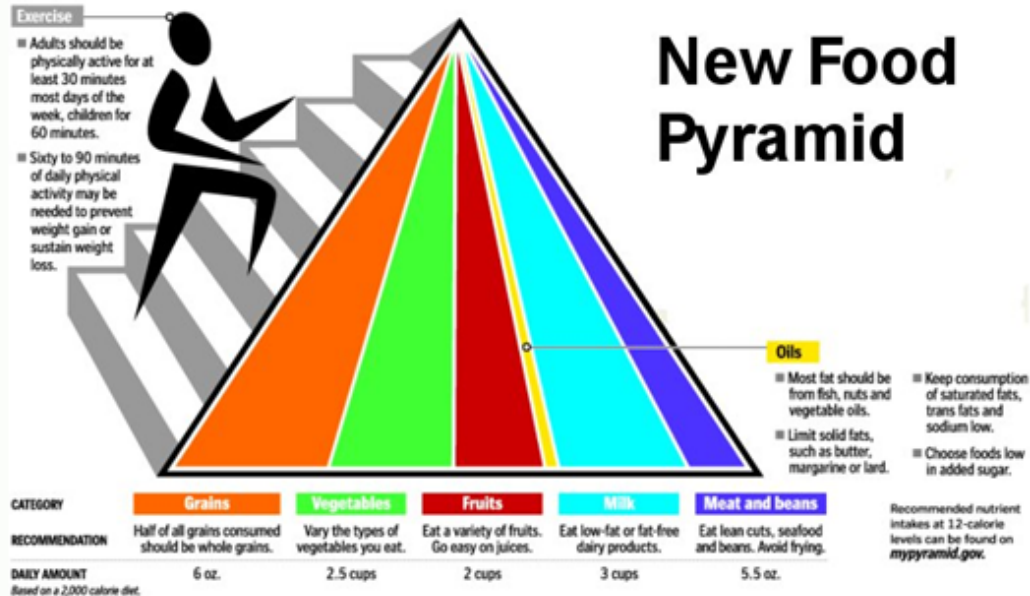
- Sleep and Relaxation
 - Movement and Exercise
 - Nutrition and Diet
 - Stress and Stress Management
 - Community and Relationships
- 



USA Food Guide Comparison Through the Years



New Food Pyramid



- Fats, Oils, & Sweets have a surprisingly large visual portion compared to later food guides
- Specific food categories, highly descriptive

- Exercise Added to Food Guide
- Oils became smaller visual representation



- Simplified Graphic Approach
- No Exercise in graphic
- Meat & Beans change to a more generic “protein” category
- Milk became “dairy”
- Elimination of serving size in exchange for proportion compared to other items on plate

MEDICATIONS

SUPPLEMENTS

NUTRIENT TIMING

MICRONUTRIENTS

MACRONUTRIENTS

ENERGY BALANCE

Nutrition and Lifestyle
Pyramid

SLEEP

MOVEMENT

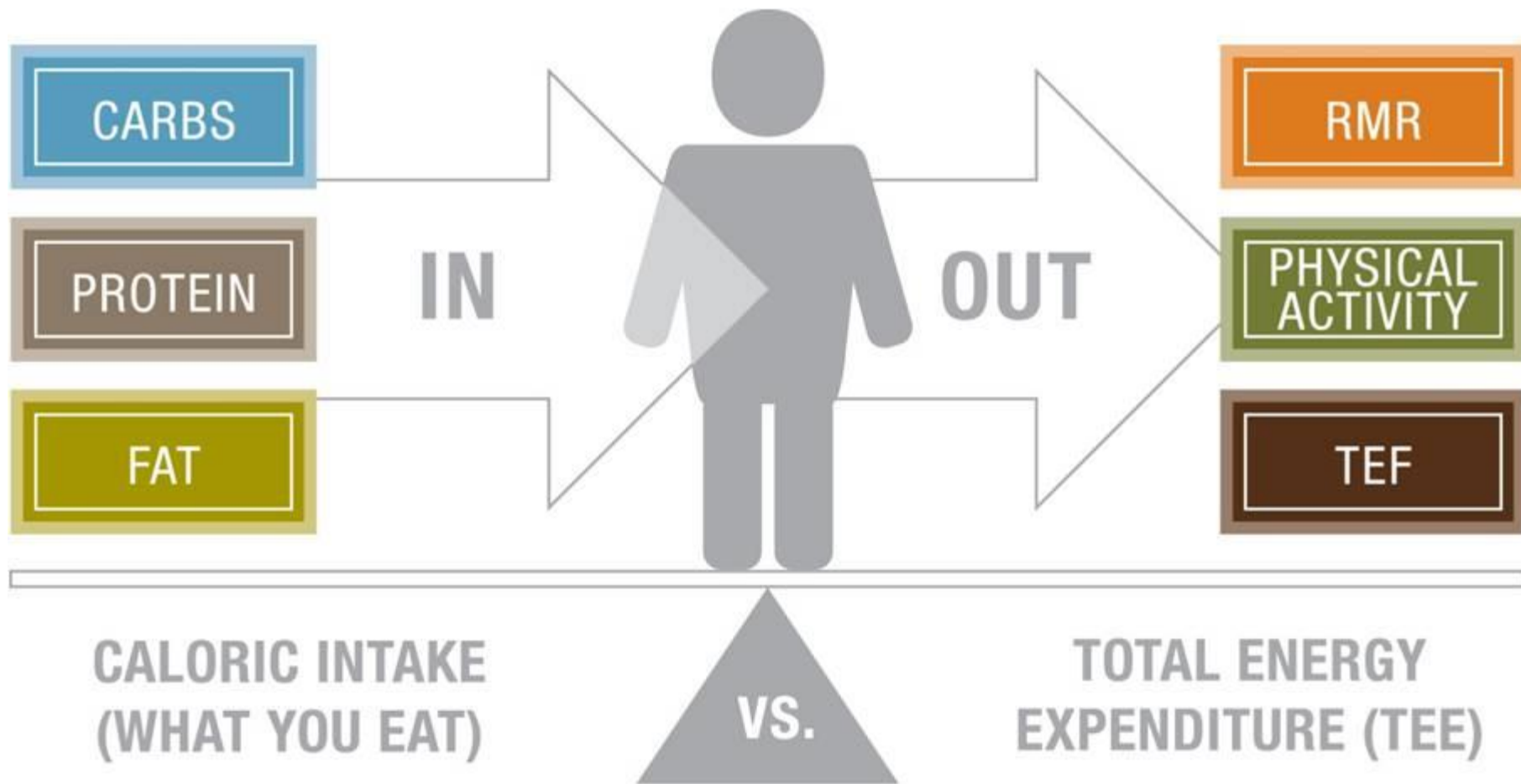
NUTRITION

STRESS

COMMUNITY



ENERGY BALANCE



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Nutrition and Lifestyle Pyramid



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NUTRITION and FOOD

- Diet
 - Standard American Diet
 - Modified Mediterranean Diet
 - Ketogenic Diet



Ketogenic Diet



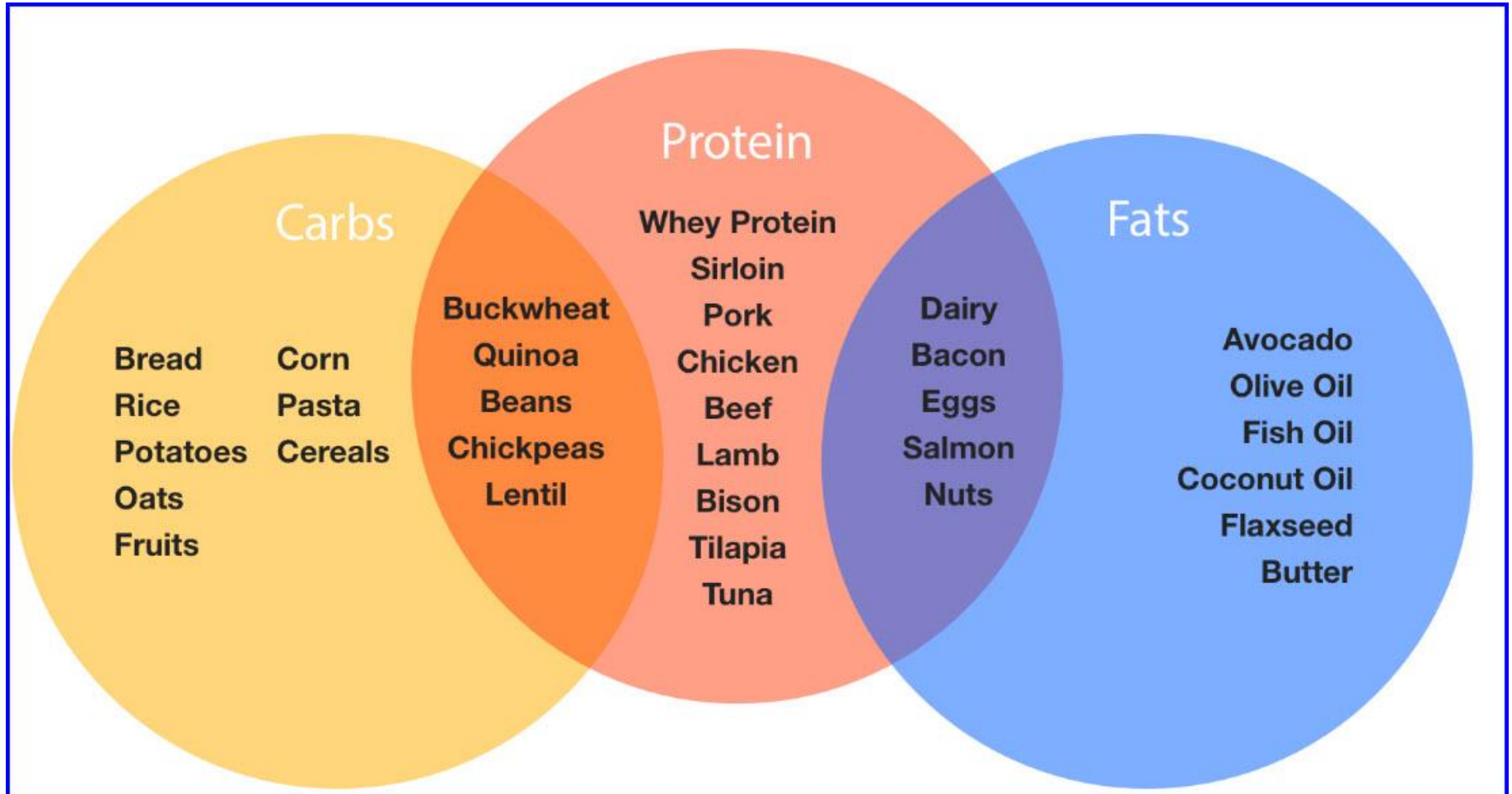
- **Macronutrient Ratio**
 - 10% Carbohydrates
 - 30% Protein
 - 60% Fat

 - May go up to 70-80% Fat

What FUEL are you running on?

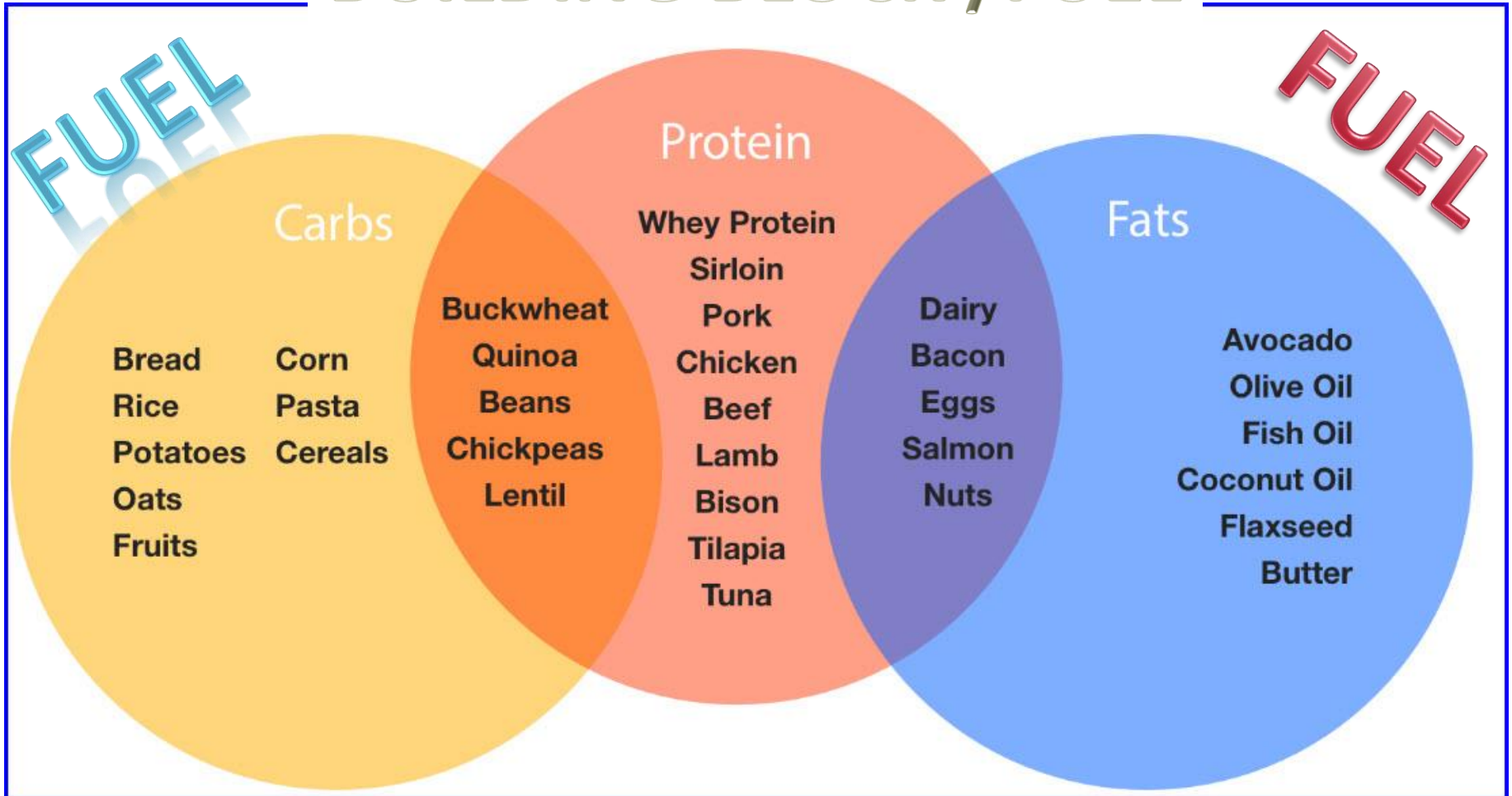


Understanding Macronutrients as Fuels



Understanding Macronutrients as Fuels

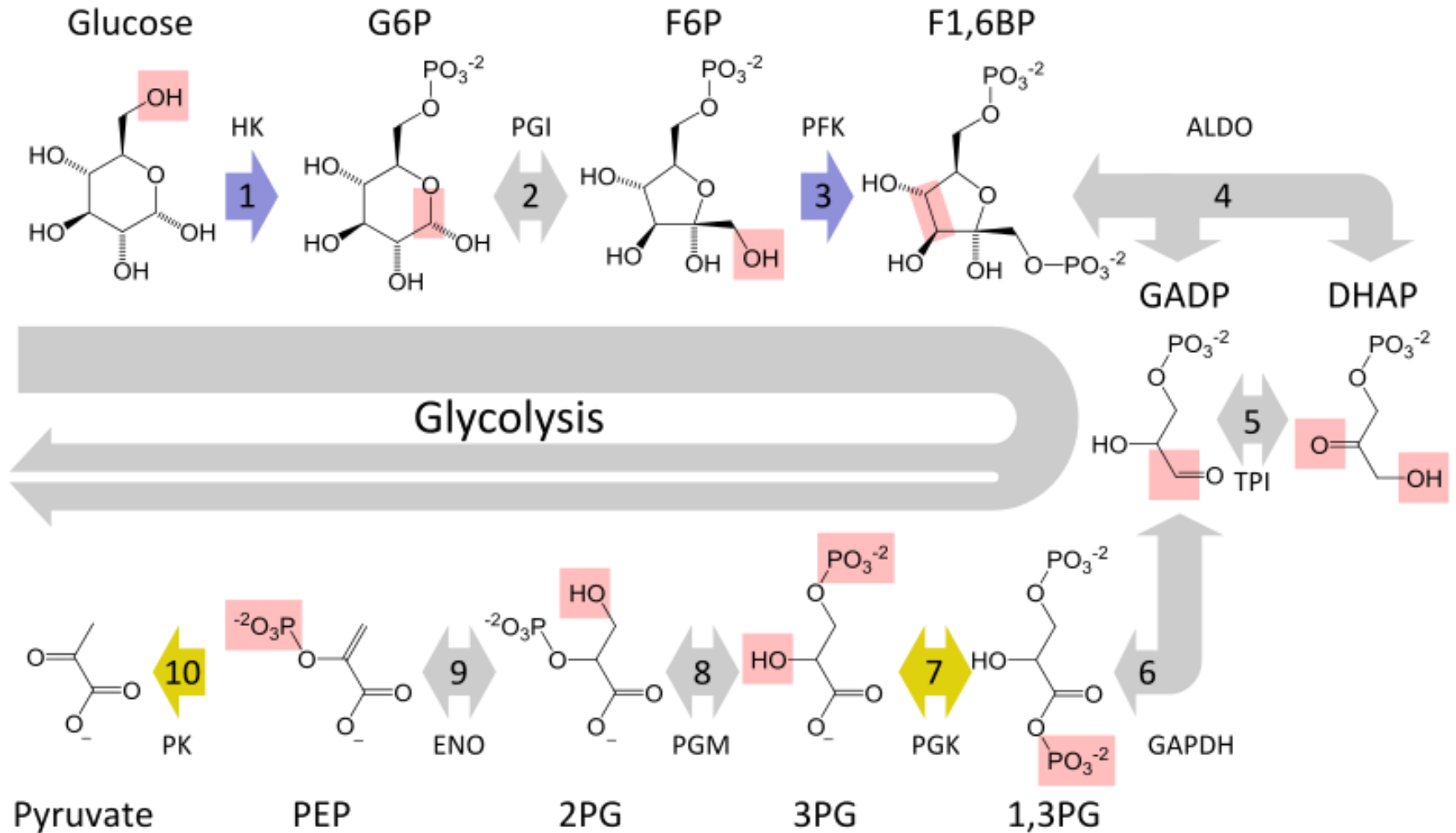
BUILDING BLOCK /FUEL



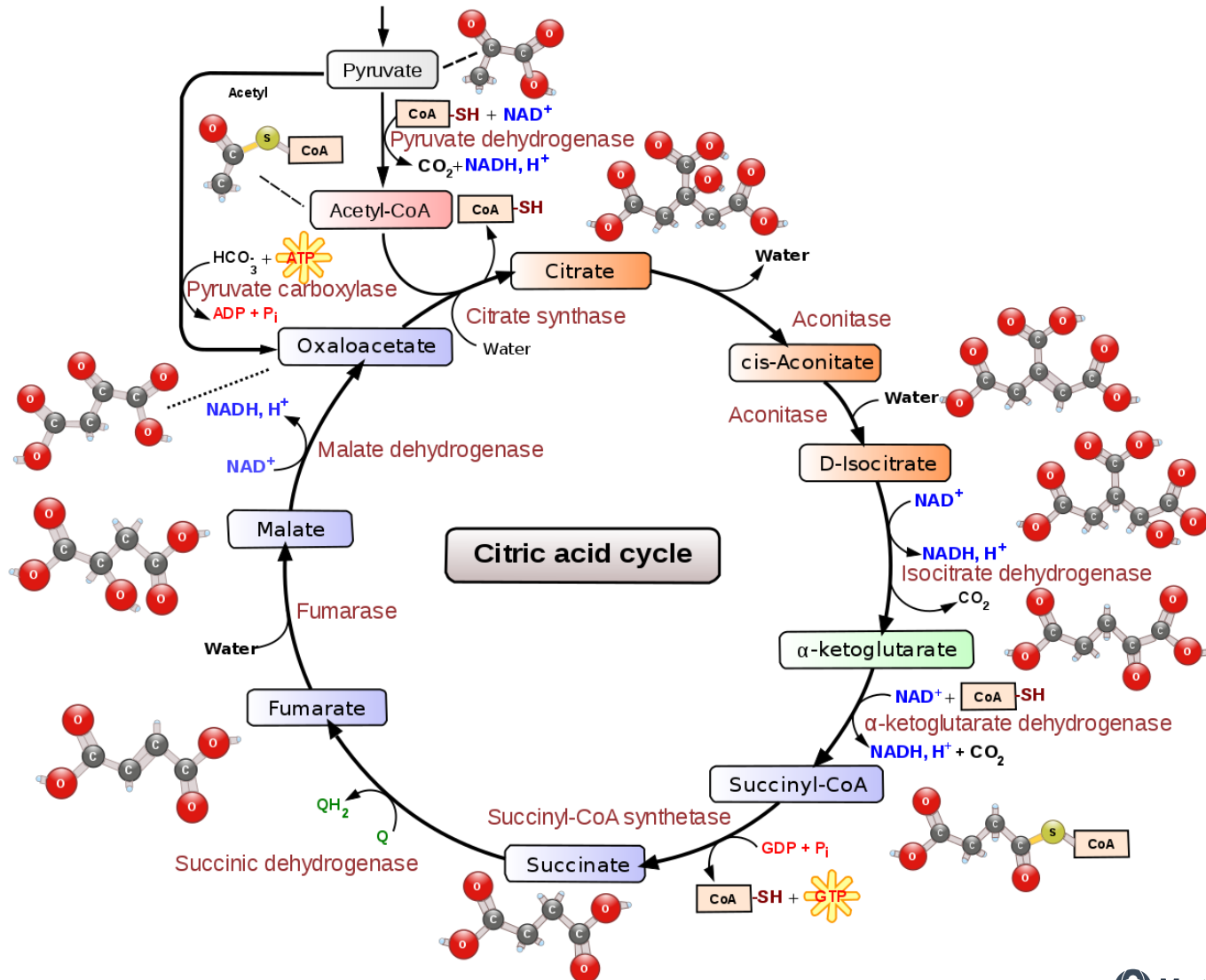
Understanding Macronutrients as Fuels



Carbohydrate/Protein Metabolism



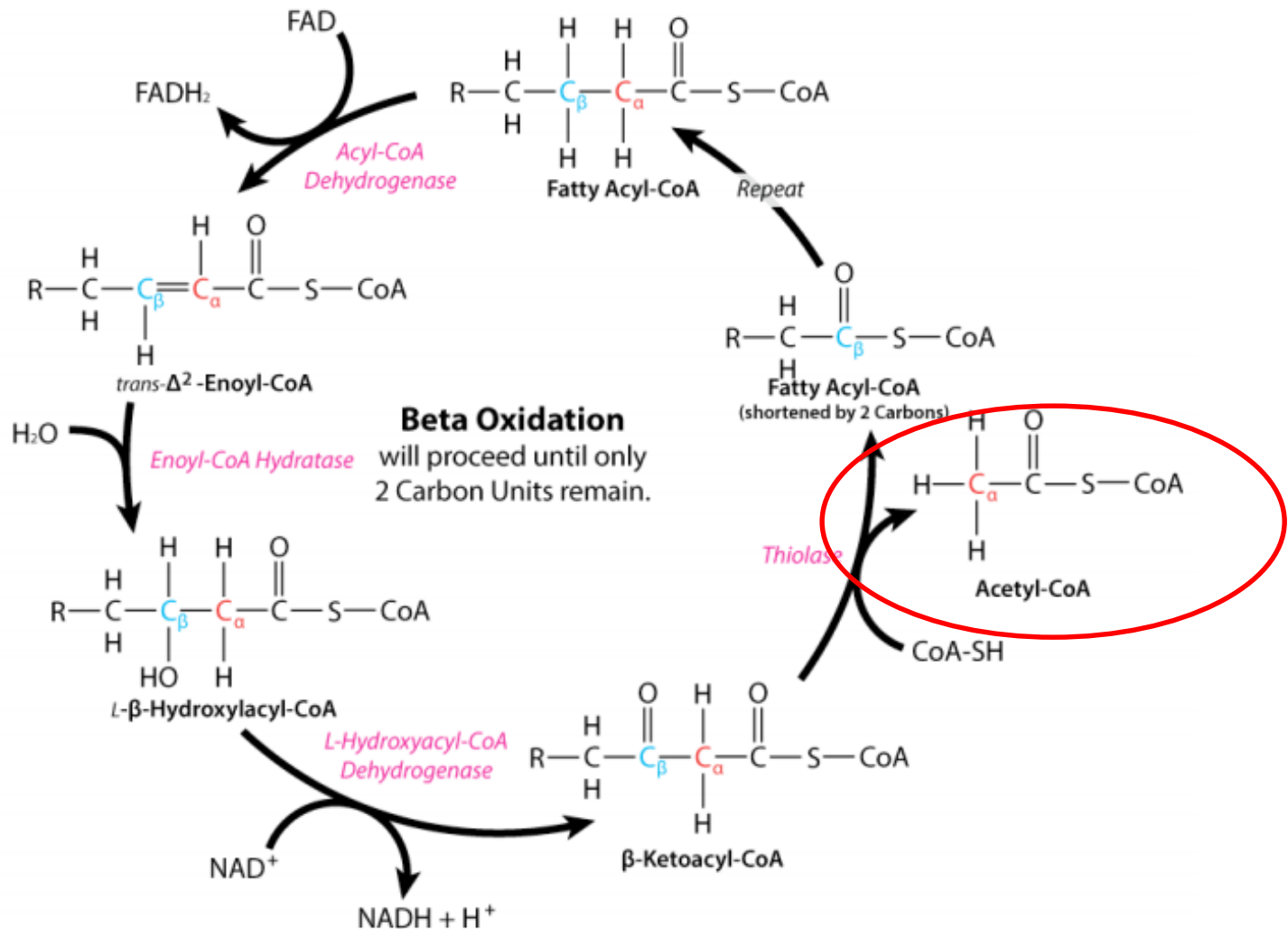
Carbohydrate/Protein Metabolism



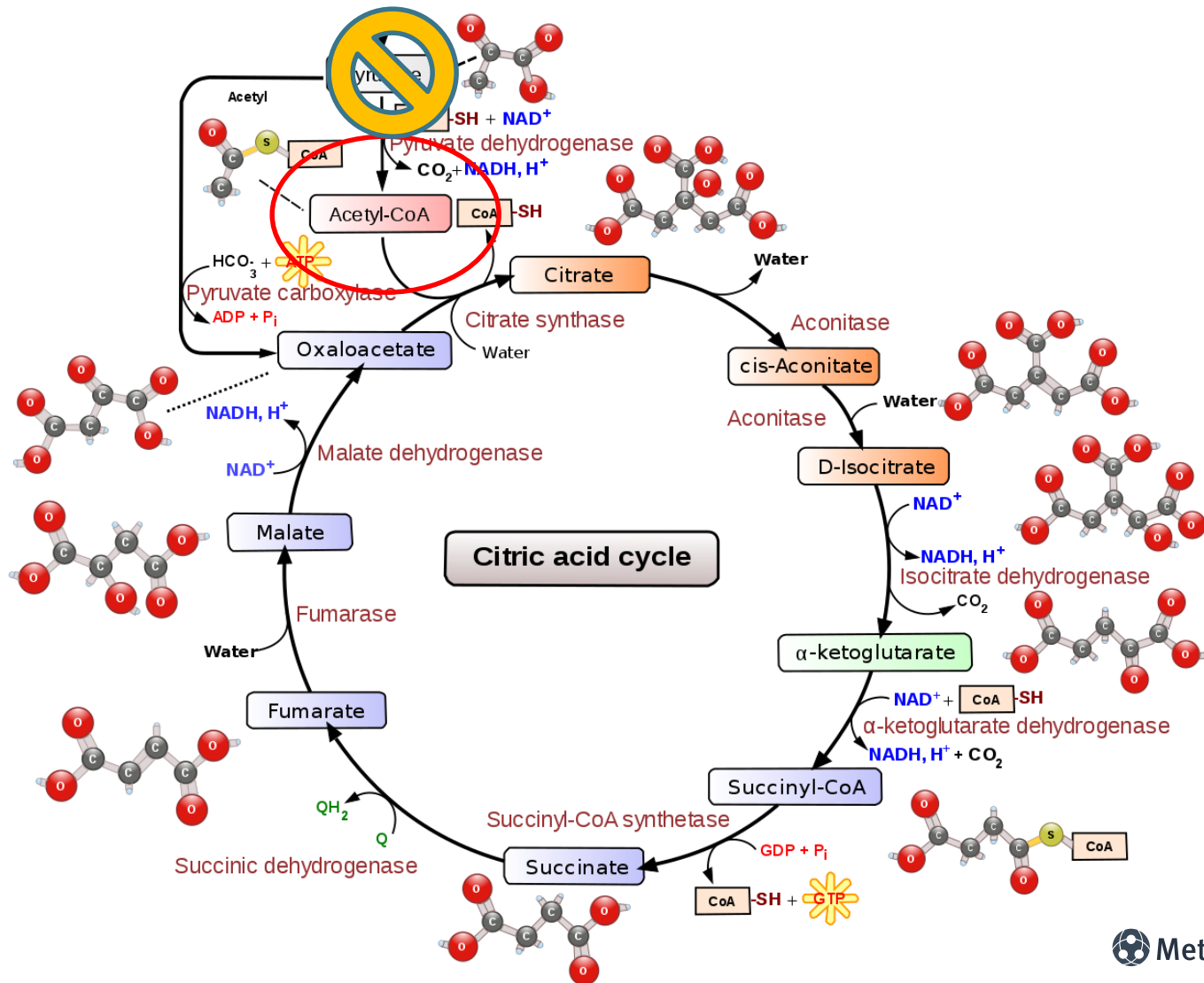
Understanding Macronutrients as Fuels



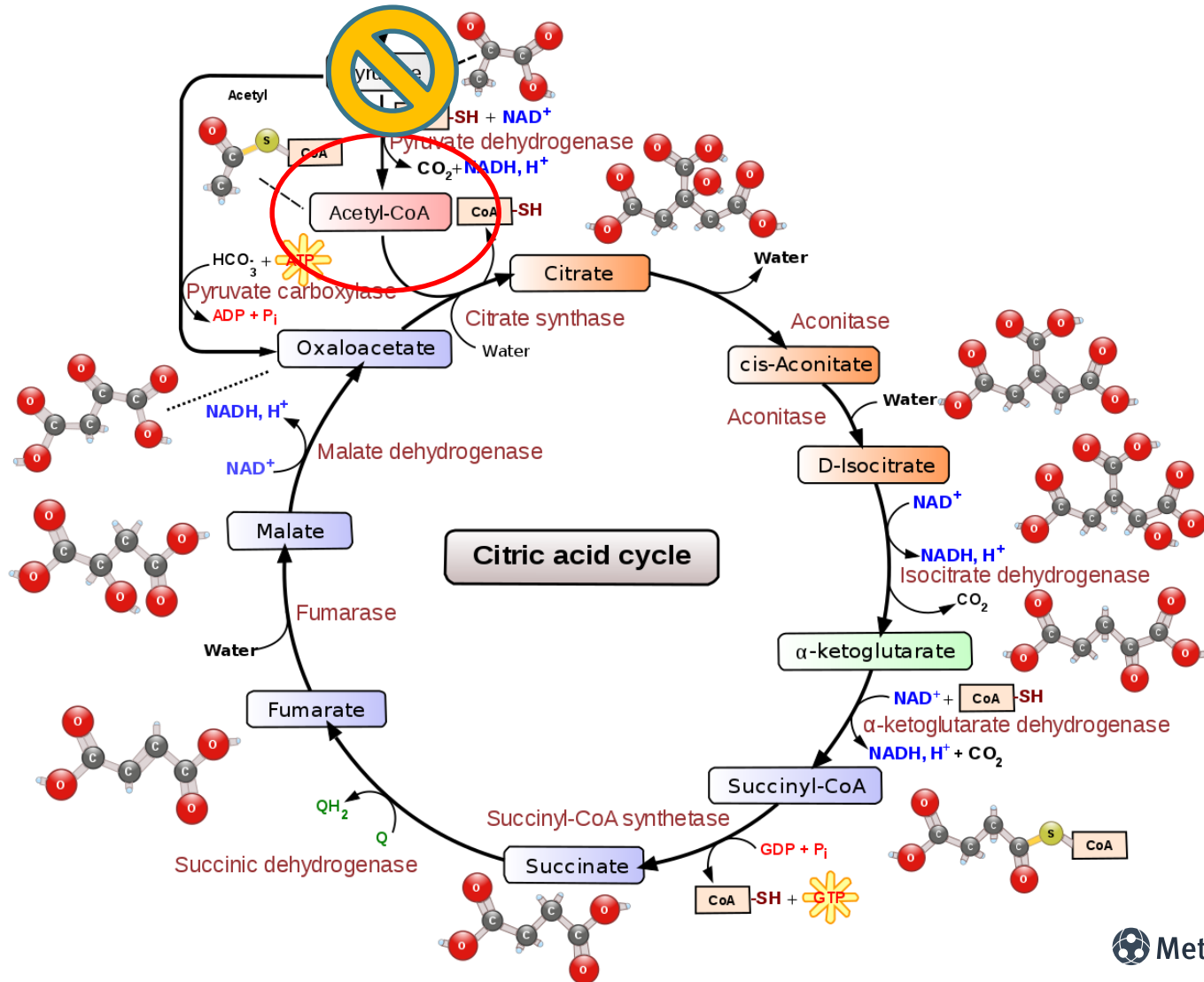
Fat Metabolism



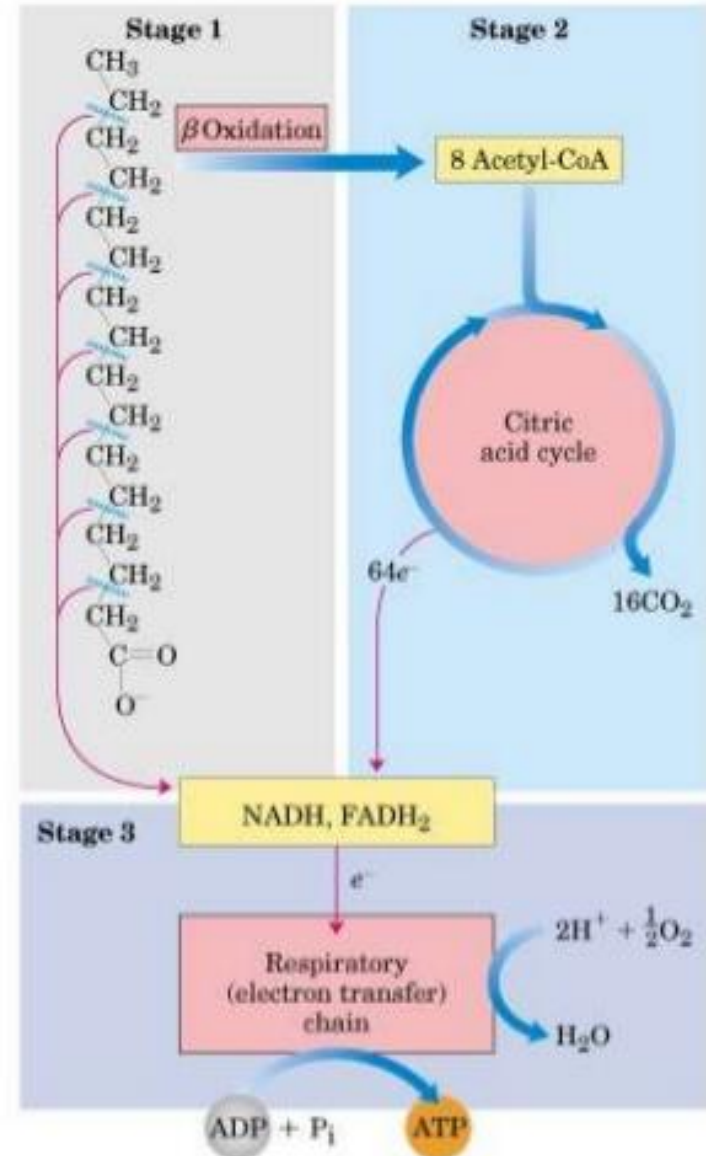
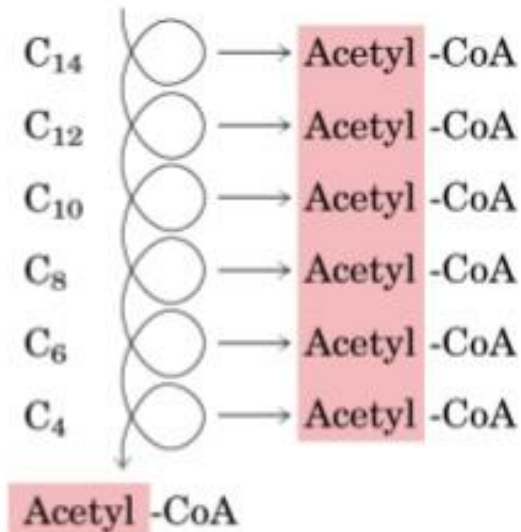
Carbohydrate/Protein Metabolism

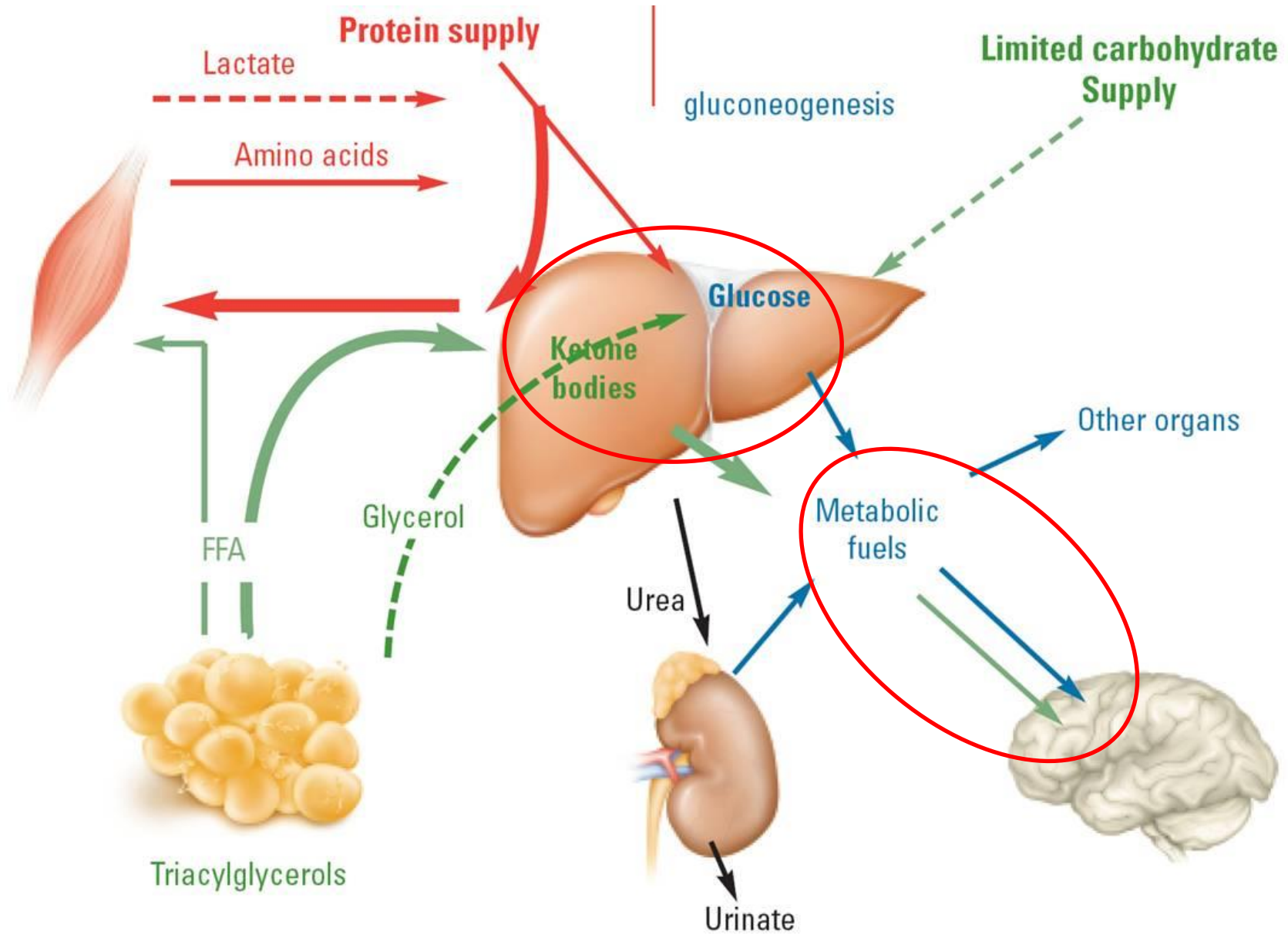


Fat / Keto Metabolism

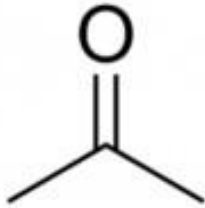


β -oxidation – first of three stages of fatty acid oxidation

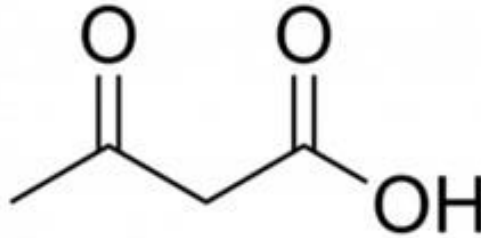




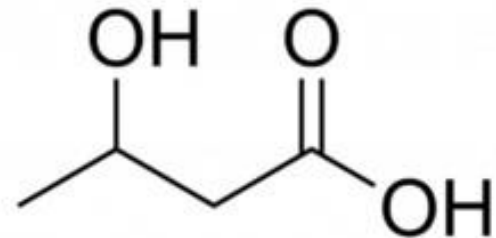
Ketone Bodies



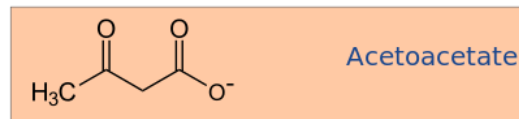
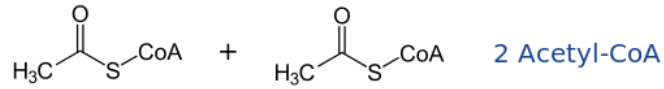
Acetone
(technically, a ketone)



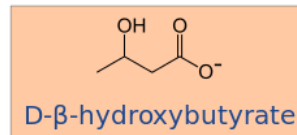
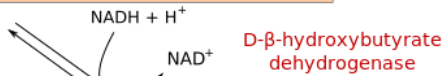
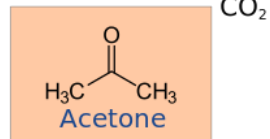
Acetoacetic acid
(technically, a ketone)

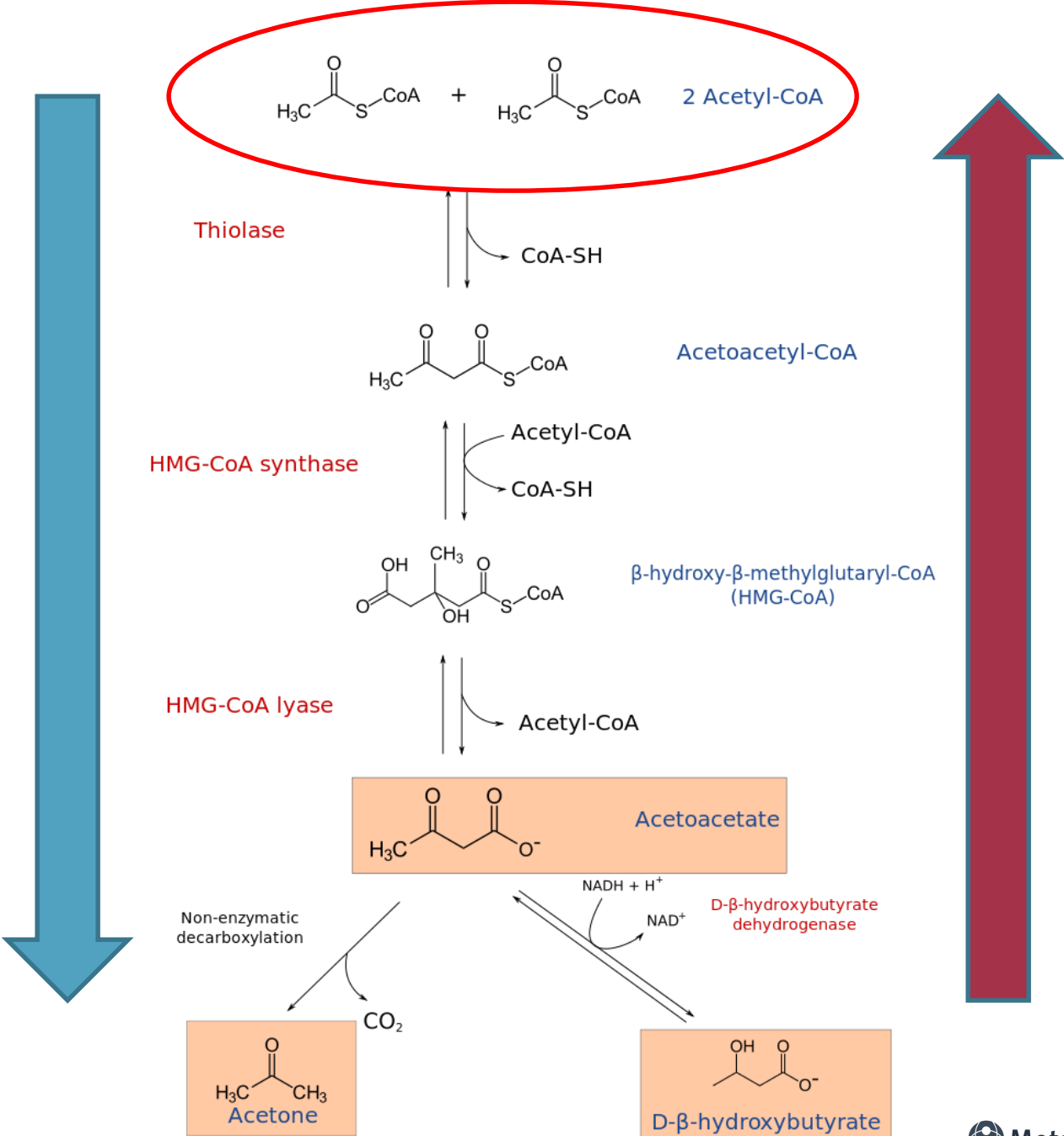


Beta-hydroxybutyric acid
(technically, **NOT** a ketone)



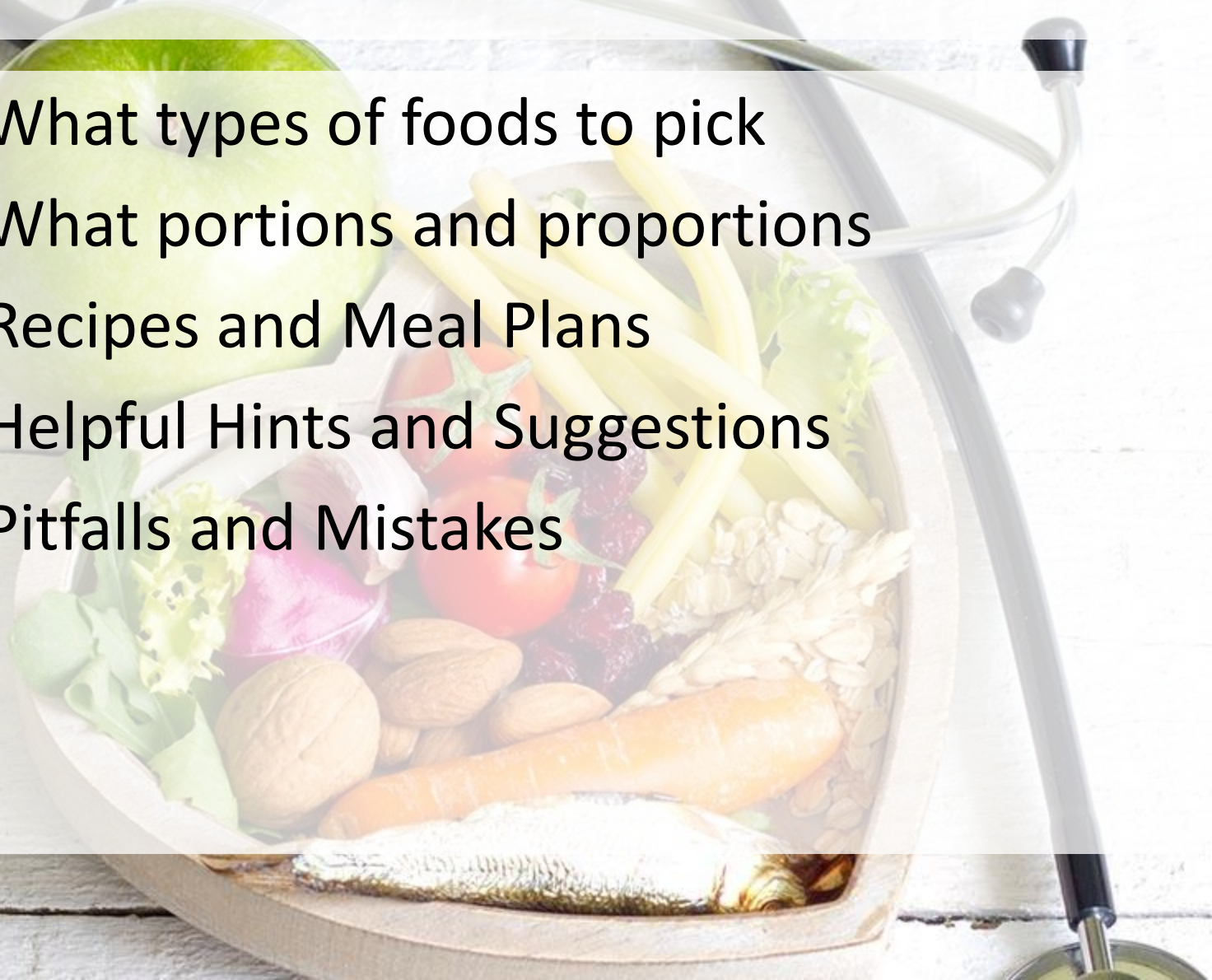
Non-enzymatic decarboxylation



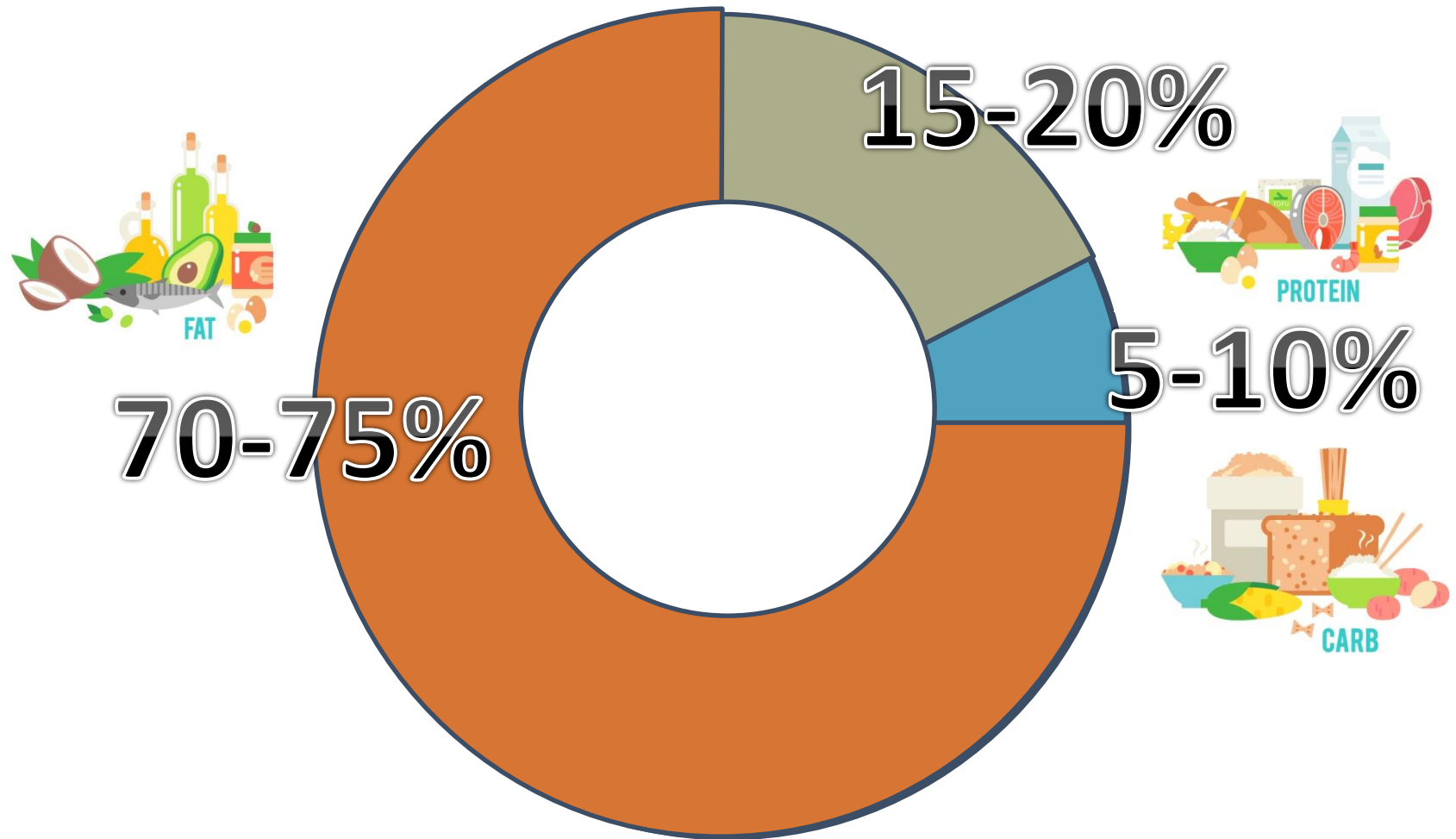


Guidelines to the Ketogenic Diet

- What types of foods to pick
- What portions and proportions
- Recipes and Meal Plans
- Helpful Hints and Suggestions
- Pitfalls and Mistakes



Breakdown of Ketogenic Diet





70-75%



15-20%



5-10%



Foods to Eat

Do Eat

- Meats – beef, pork, lamb, poultry, eggs, fish etc.
- Leafy Greens – lettuce, spinach, kale, etc.
- Above ground vegetables – broccoli, cauliflower, etc.

Foods to Eat

Do Eat

- High Fat Dairy – Full fat yogurts, hard cheeses, high fat cream, butter, etc.
- Nuts and seeds – macadamias, pecans, almonds, walnuts, sunflower seeds, etc.
- Other fats – coconut oil, high-fat salad dressing, saturated fats, etc.

Foods to Eat

A collage of various fresh foods including salmon, eggs, berries, and vegetables. The background is a soft-focus image of these items, with a semi-transparent white box overlaid in the center containing the text.

Do Eat

- Avocado and berries – raspberries, blackberries, and other low glycemic impact berries
- Sweeteners – stevia, erythritol, monk fruit, and other low-carb sweeteners

Foods to Avoid



Do Not Eat

- Grains – wheat, corn, rice, cereal, etc.
- Sugar – honey, agave, maple syrup, etc.
- Fruit – apples, bananas, oranges, etc.
- Tubers – potato, yams, etc.



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MVP

MVP's

- Minerals
- Vitamins
- Phytonutrients



MVP's

- Minerals
- Vitamins
- Phytonutrients



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Variety in Ketogenic Plans



Some interesting Keto Variations

- Options for Ketogenic Plans

STANDARD



20-50 g of
carbs per day

CYCLICAL



Low carbohydrates
for several days
followed by eating high
carbohydrates for a few days

TARGETED



20-50 grams of carbs for the
day, but 30-60 minutes prior
to exercise incorporating all
or more carbohydrates

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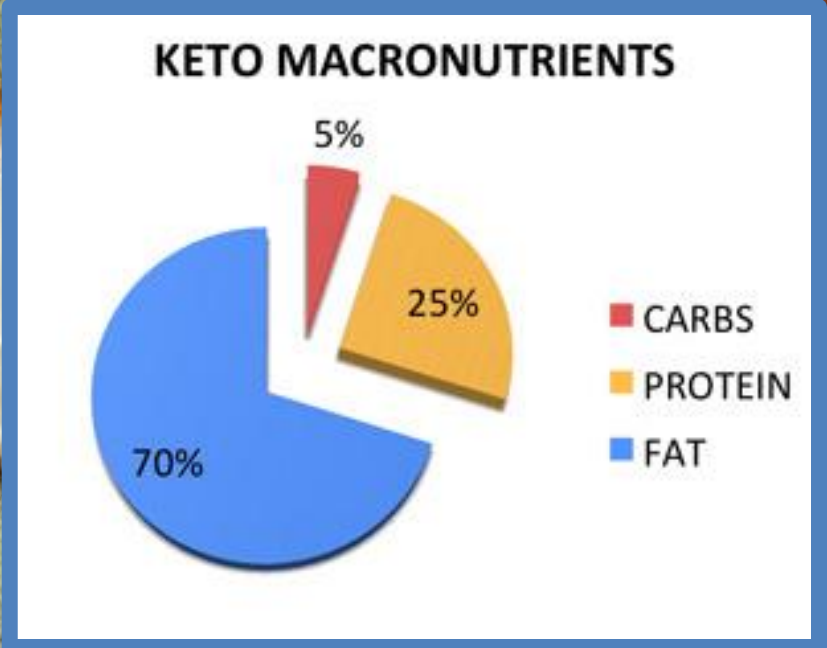
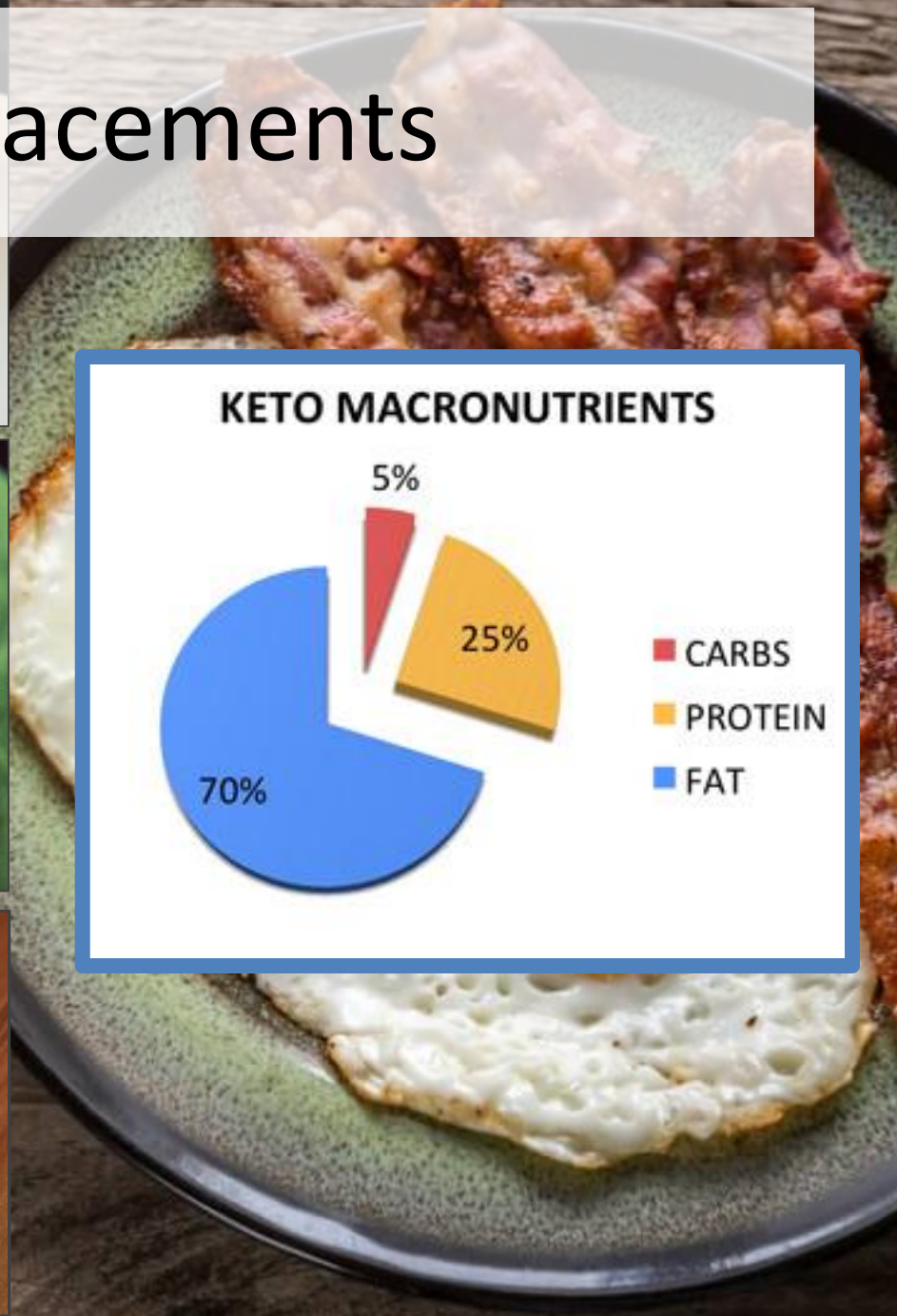
MOVEMENT

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Meal Replacements



Medium Chain Triglyceride Oil



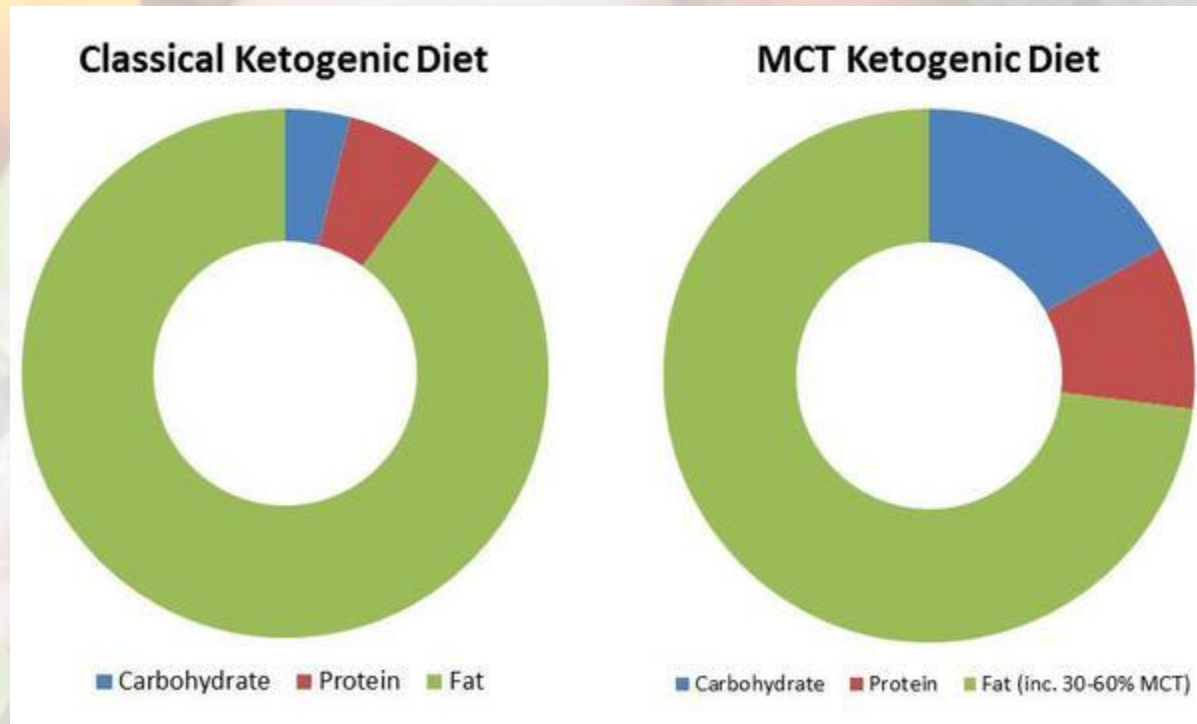
Medium Chain Triglyceride Oil

- Short Chain Triglycerides
 - Carbon chains: 1-2-3-4-5
 - Produced mostly by fermentation of fiber by colonic bacteria
- Medium Chain Triglycerides
 - Carbon chains: 6-8-10-12(?)
 - Diffusely pass through GI
 - Rapid conversion /energy
 - Coconut, Palm and Dairy
- Long Chain Triglycerides
 - Carbon Chains: 14+
 - Very Long Chain 22+
 - Longer digestion period
 - Nuts, Avocado, Fish and Meat



WHY Choose MCT at all?

- Higher incorporation of other foods into dietary plan leading to Ketosis.



MCT Oil vs. Powder



*Medium Chain Triglycerides
Oil and Powder*

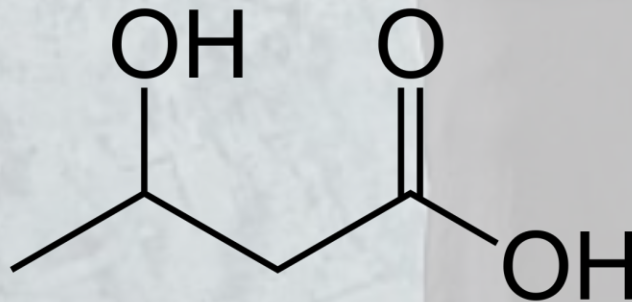
MCT Oil vs. Powder

- MCT powder tends to have less concentration of MCT oil
- WHY choose powder?
 - Ease of incorporation into a solid food or recipe (baking recipe or any other powdered product)
 - Slower release of the MCT oil during consumption
 - MCT powder tend are a more convenient on-the-go option in single serving (powders are generally easier to transport than liquids)
 - Less GI distress occurs when consuming MCT oils




Keto Salts

- Exogenous Ketones / Keto Salts
 - BHB with additional salts attached
 - (Calcium, Magnesium, Sodium or Potassium)



- Transitioning into KETOSIS faster

Keto Salts

A muscular man in a black tank top is shown from the waist up, drinking from a red water bottle. He is looking to the right. The background is a light, textured wall.

- Exogenous Ketones / Keto Salts
 - More rapid transition into ketosis when on ketogenic diet
 - Suppression of Hunger
 - Improved Cognition
 - Improved Performance

What to expect from a Ketogenic Diet

A photograph of a stack of smooth, light-colored stones on a beach. The stones are stacked in a way that they appear to be balancing on each other. The background is a clear blue sky and a glimpse of the ocean. The text "Balance in Transition" is overlaid on the image in a white box.

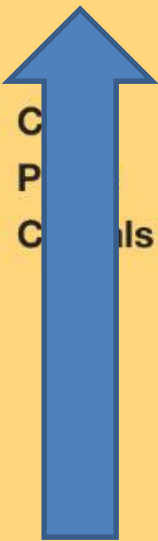
Balance in Transition

FUEL

FUEL

Carbs

- Bread
- Rice
- Potatoes
- Oats
- Fruits



Protein

- Whey Protein
- Sirloin
- Pork
- Chicken
- Beef
- Lamb
- Bison
- Tilapia
- Tuna
- Dairy
- Bacon
- Eggs
- Salmon
- Nuts

Fats

- Avocado
- Olive Oil
- Fish Oil
- Coconut Oil
- Flaxseed
- Butter

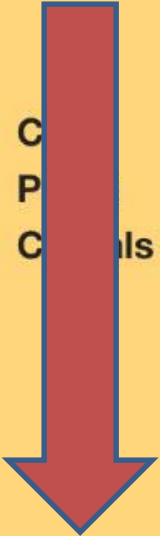


KETO FLU



FUEL

Carbs



- Bread
- Rice
- Potatoes
- Oats
- Fruits

Lentil

Bison
Tilapia
Tuna

Nuts

FUEL

Fats



- Avocado
- Olive Oil
- Fish Oil
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- Flaxseed
- Butter

KETO FLU



- Ketones are diuretics
- Ketones are a new energy source
- Ketones are produced from new foods
 - New Food can produce GI Side Effects

KETO FLU

- Fatigue
- Sugar cravings
- Dizziness
- Difficulty focusing
- Nausea
- Difficulty Getting To Sleep
- Irritability
- Stomach Irritability
- Muscle Cramps



Helpful Hints to Help Transition

- WATER
- FIBER
- SALT
 - Himalayan
 - Truffle
 - Sea Salt
- KETO SALTS



Preparation: Managing Expectations

- Transition will take some time
 - Mental/Physiological Transition
 - 24-72 hours
 - Physical/Physiological Transition
 - 7-10 days

Preparation: Managing Expectations

- Prepare your patients for mental changes in the first 24-72 hours
 - Low Stress Environment for the first 24-72 hours
 - Cerebral/Cognitive Adjustments in 24-72 hours
 - Physical / Strength / Endurance adjustments 7 days
- Keep your patients focused on long term goals
 - Journal / Recording (emotional as well as physical)
 - Tangible / Visual Reward System

Preparation: Managing Expectations

- Prepare your patients for physical changes in the first 7-10 days
 - Decrease in Strength and Power
 - Change in exercise routine to accommodate
 - Minimal changes in aerobic capacity
 - Incorporate more into exercise routine
 - Sleep disturbances
 - Incorporate rituals/supplementation to be proactive
 - Physical / Strength / Endurance adjustments 7-10 days

Summary Points

- Diets and Food Plans can be understood with common factors (Nutrition and Lifestyle Pyramid)
- KETOGENIC plans are a practical food plan and should be added to current food plan options
- KETOGENIC plans are dictated by macronutrient ratios and fuel sources.
- KETOGENIC plans have variability based on nutrient timing.
 - Can be used in different circumstances and different populations/goals

Summary Points

- KETOGENIC meal replacements must meet KETOGENIC macronutrient ratios
 - Shakes, Bars, Soups
- MCT can be helpful for KETOGENIC plans
 - Less total fat needed
 - More variety with other macronutrients
 - Powder vs. Oil
 - Purity levels
 - GI Tolerance

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 - Powder vs. Oil
 - Purity levels
 - GI Tolerance
 - Oil for slow GI / Powder for rapid and sensitive GI

KETO



Christopher Keroack, MD IFMCP

New England Center for Functional Medicine

KETO



A Functional Medicine Approach to Ketogenics: Common Clinical Uses

Christopher Keroack, MD IFMCP

New England Center for Functional Medicine

What is Functional Medicine?



What is Functional Medicine?

- Functional Medicine is a medical practice or treatment that focus on optimal functioning of the body and its organs, usually involving systems of holistic or alternative medicine.

“You don't have to have a disease to benefit from functional medicine...”

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2. Back and Joint disorders

- Especially osteoarthritis

3. Cardio-metabolic Disease

- Cholesterol problems, High Blood Pressure and Diabetes.

4. Upper respiratory conditions

- Cough and Breathing disorders/Shortness of Breath

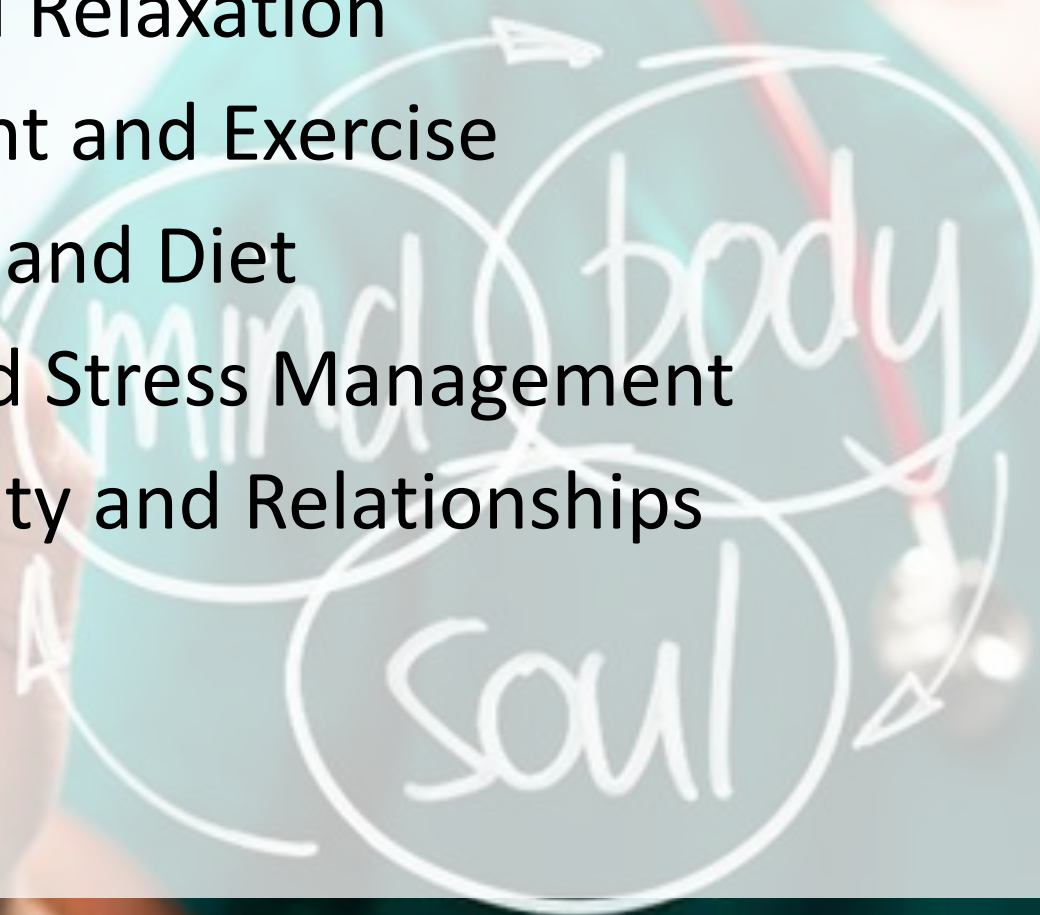
5. Chronic neurologic disorders

- Anxiety, bipolar disorder and depression
- Headaches and Migraines



5 major factors influencing our health

- Sleep and Relaxation
- Movement and Exercise
- Nutrition and Diet
- Stress and Stress Management
- Community and Relationships





mind body

soul

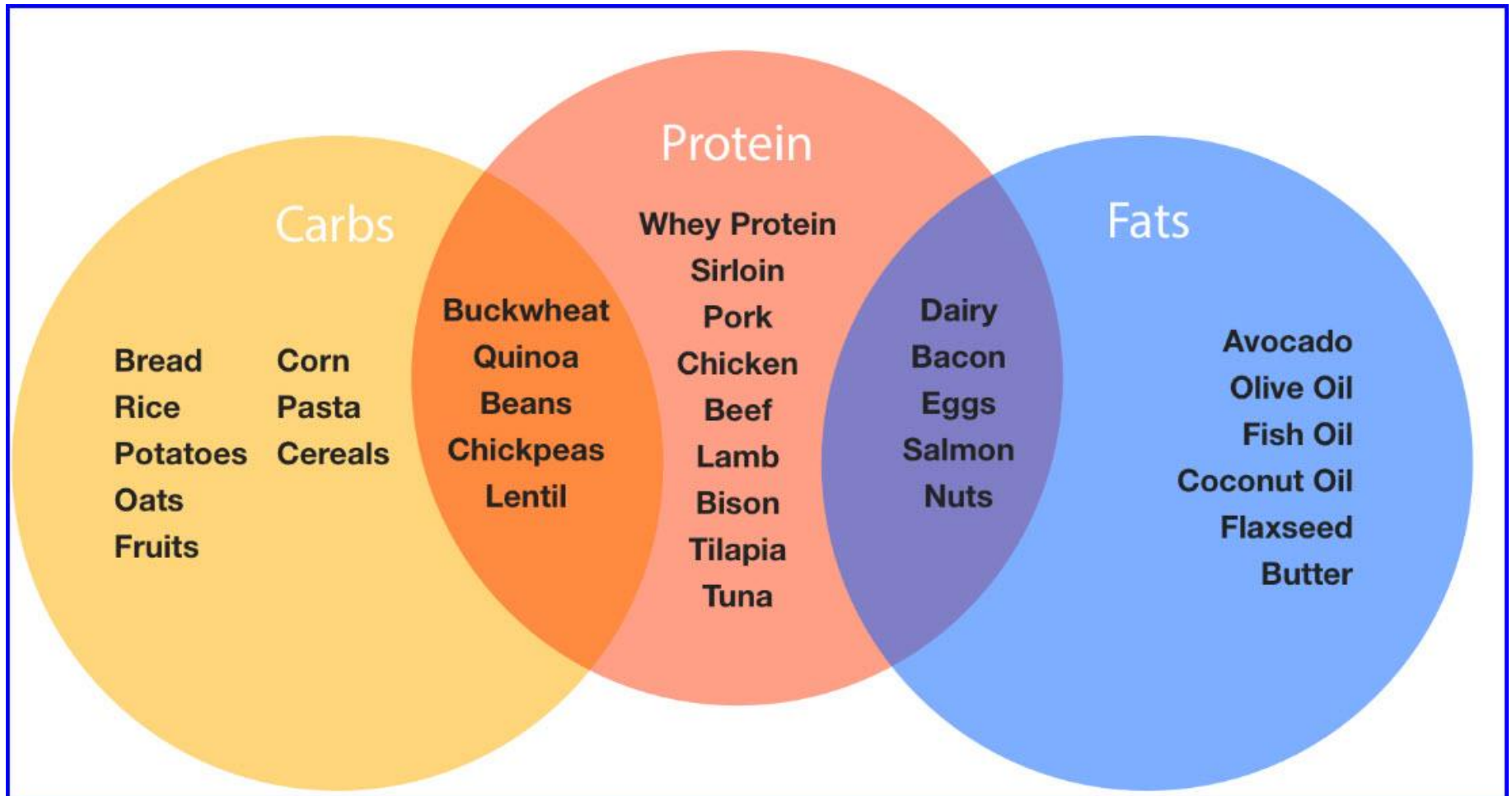
A

Ketogenic Diet



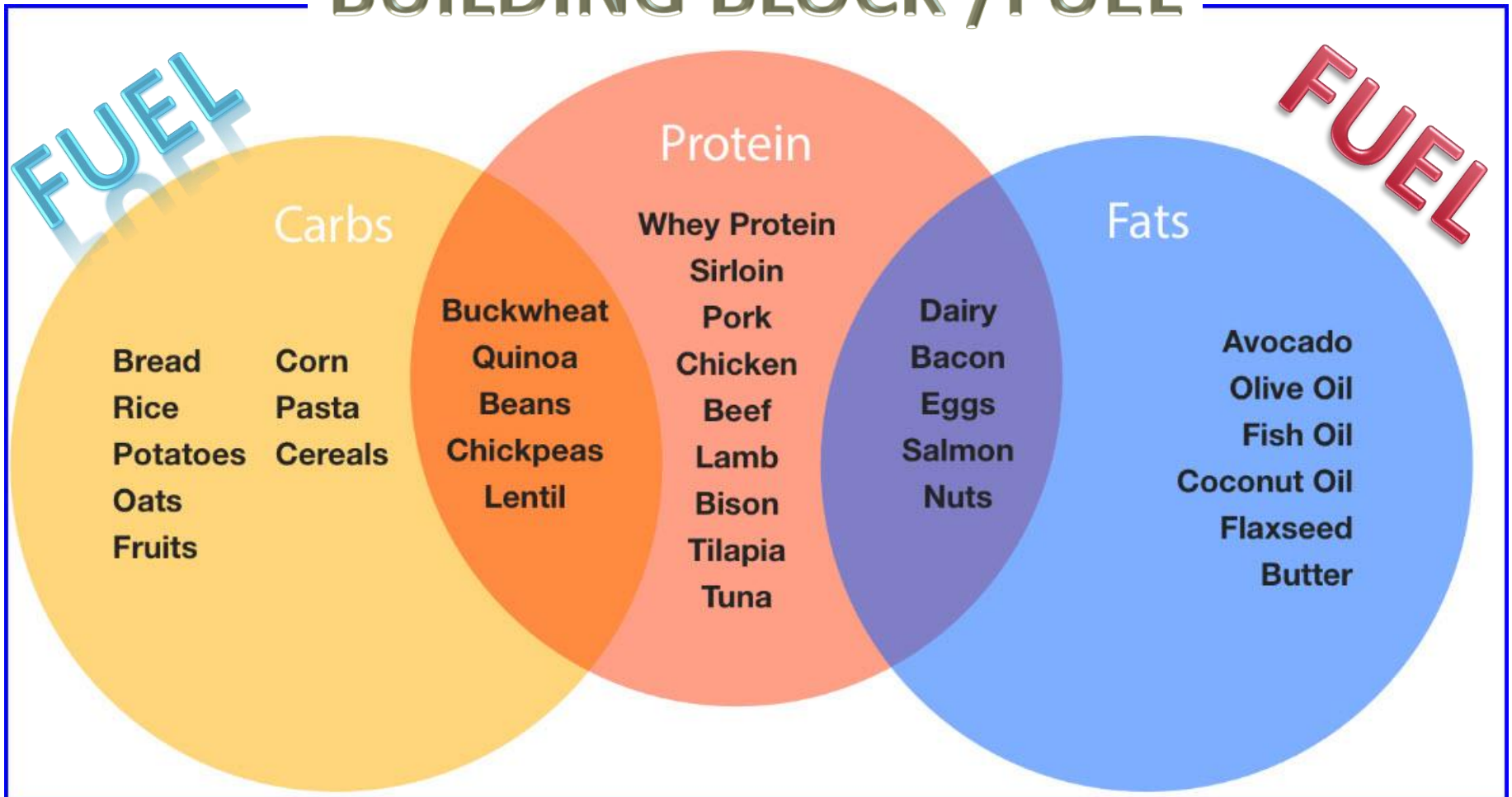
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Understanding Macronutrients as Fuels



Understanding Macronutrients as Fuels

BUILDING BLOCK /FUEL

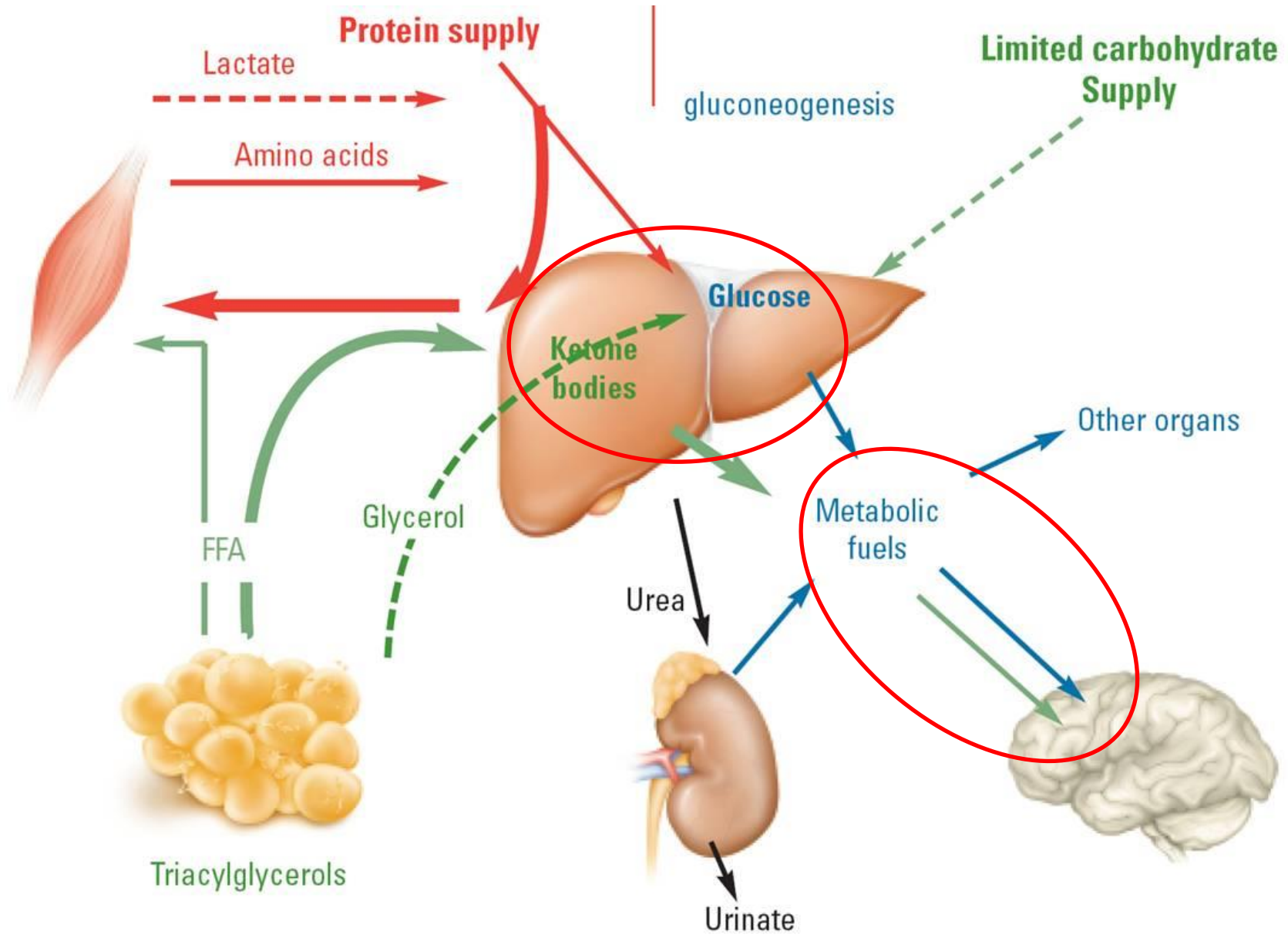


Understanding Macronutrients as Fuels



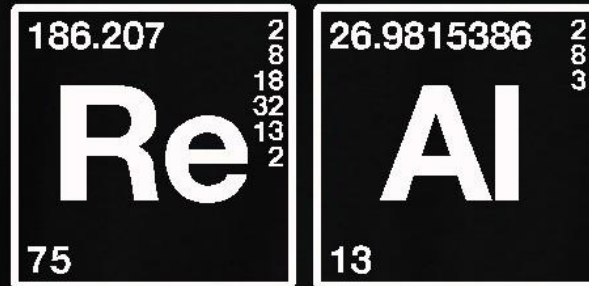
Understanding Macronutrients as Fuels





Ketogenic Plans in Clinical Practice

science is



- Strong Evidence
- Emerging Evidence/ Theoretical Evidence



Therapeutic Role of Ketogenic Diets

- **Weight Loss**
 - **CALORIC DEFICIT Theory**
 - Reduction in Appetite
 - Higher Satiety of Proteins
 - Satiety/Appetite Hormones (Insulin, Leptin, Ghrelin, etc.)
 - Direct Appetite Suppression from Ketone Bodies

Therapeutic Role of Ketogenic Diets

- Weight Loss
 - METABOLIC Theory
 - Most subjects in Ketogenic plans lose MORE weight in the first 3-6 months compared to other plans of matching caloric deficit
 - Energy expense from proteins is “expensive” (Nitrogen)
 - Energy cost of Gluconeogenesis (~400-600 kcal/day)
 - Appetite suppression of Ketosis/Ketones
 - Satiety/Appetite Hormones (Insulin, Leptin, Ghrelin, etc.)
 - Diuretic effect of Ketones

Therapeutic Role of Ketogenic Diets

- Weight Loss
 - COMBINATION Theory
 - Reduced appetite due to higher satiety effect of proteins
 - Appetite/Satiety control hormones
 - Direct appetite-suppressant action of Ketones
 - Reduction in lipogenesis and increased lipolysis
 - Insulin levels changes
 - Reduction in the RQ leading to greater metabolic efficiency in metabolizing fats
 - Increased metabolic costs of gluconeogenesis
 - Thermogenic effect of protein metabolism

Therapeutic Role of Ketogenic Diets

- Cardiovascular Disease
 - Reducing carbohydrate intake to ketosis levels brings significant benefits to blood lipid levels
 - Largest impact on Triglycerides
 - Insulin dependant pathways
 - Insulin sensitivity promotes the synthesis of lipoprotein lipase
 - Total Cholesterol reduction
 - HDL cholesterol increase
 - Increase size and volume of LDL cholesterol
 - Reduction of Cardiovascular Risk

Therapeutic Role of Ketogenic Diets

- Cardiovascular Disease
 - Insulin / Insulin Sensitivity
 - Decrease in dietary carbohydrates
 - Decrease in insulin secretion
 - Increase in insulin sensitivity
 - Insulin / Insulin Sensitivity activated enzyme
 - 3-hydroxy-3methylglutaryl-CoA reductase
 - » Targeted action of prescription Statins
 - » Activated by insulin/insulin sensitivity
 - Decrease on Cholesterol production overall

Therapeutic Role of Ketogenic Diets



- Type 2 Diabetes / Insulin Resistance
 - Impaired glucose uptake by muscle tissue
 - Diversion of Carbohydrates to the Liver
 - Conversion to fat (*de novo lipogenesis*)
 - Carbohydrate “intolerance”
 - Increased Lipogenesis
 - especially VISCERAL FAT

A hand holding a blue digital glucose meter with a white screen showing '94' and '10:10'. The background is a soft-focus image of a hand holding a glucose meter.

Therapeutic Role of Ketogenic Diets

- Type 2 Diabetes / Insulin Resistance
 - Ketogenic Diets interventions
 - Reduction in Exogenous Insulin use
 - Weight Loss
 - Lower Hepatic Glucose Output
 - Reduction in Hemoglobin A1C
 - Increase/Improvement in Insulin Sensitivity (HOMA-IR)

Therapeutic Role of Ketogenic Diets



- Type 2 Diabetes / Insulin Resistance
 - Ketogenic Diets interventions (extended studies 12-56 weeks)
 - Improvements
 - Fasting Glucose
 - Total Cholesterol
 - HDL Cholesterol
 - LDL Cholesterol
 - Triglycerides
 - Lowering Hemoglobin A1C
 - Withdrawal of Insulin and Glycemic Control Medication
 - Often BEFORE significant weight loss

Therapeutic Role of Ketogenic Diets

A hand holding a digital glucose meter and a finger being pricked for a blood sample. The meter displays a reading of 94. The background is a soft-focus image of a hand holding a glucose meter and a finger being pricked for a blood sample.

- Type 2 Diabetes / Insulin Resistance
 - Ketogenic Diets interventions
 - Symptomatic Improvement
 - Objective Improvements in biomarkers
 - Less Glucose coming in
 - Less Insulin being produced
 - Greater Insulin sensitivity

Therapeutic Role of Ketogenic Diets

- Epilepsy

- Several hypothesis are debated

- Direct anti-convulsant effect from ketones
- Reduced neuronal excitability induced by ketones
- Effect on mammalian target of rapamycin pathway (mTOR)
 - mTOR integrates the input from upstream pathways
 - mTOR influences how brain cells grow, differentiate and multiply
 - mTOR pathway is dysregulated in human diseases
 - » diabetes, obesity, depression, cancers and epilepsy

- Part of integrated treatment of seizure disorders

Therapeutic Role of Ketogenic Diets

- Epilepsy
 - Ketogenic diets influence neurotransmitter activity
 - Supported by literature
 - 30-40% reduction in seizures compared to control diet
 - Multi-factorial impact on overall brain health
 - Weight Loss
 - Cardiovascular Health
 - Diabetes

Therapeutic Role of Ketogenic Diets

- Emerging Evidence

- Acne

- Worsened by High Glycemic Load Foods
 - Worsened by Insulin
 - Worsened by Androgen bioavailability (SHBG)
 - Worsened by Insulin-Like Growth Factor 1 (IGF-1)

Therapeutic Role of Ketogenic Diets

- Emerging Evidence
 - Acne
 - Insulin Regulated / Influenced Pathways
 - Decreased proliferation of basal keratinocytes within the sebaceous ducts
 - Normalization of desquamation of follicular epithelium
 - Balanced androgen mediated sebum production
 - Lower colonization of the stratum corneum by *Propionibacterium acnes*
 - Decreased inflammatory pathways in skin

Therapeutic Role of Ketogenic Diets

- Emerging Evidence
 - Polycystic Ovarian Syndrome (PCOS)
 - Goal of improvement or hormonal regulatory pathways
 - Hyperinsulinemia
 - Insulin Resistance

 - Androgens
 - Estrogens
 - Progesterone

Therapeutic Role of Ketogenic Diets

- Emerging Evidence
 - Polycystic Ovarian Syndrome (PCOS)
 - Insulin resistance and related hyperinsulinemia
 - Common feature (about 65–70% of women with PCOS)
 - Hyperinsulinemia independent of weight (obesity)
 - Insulin affecting other hormones
 - » Increase in Androgens
 - Similar to Metabolic Syndrome
 - Decreases in Insulin ameliorate condition

Therapeutic Role of Ketogenic Diets



- Emerging Evidence

- Cancer

- Multi-factorial and complex disease state

- Influenced by Hyperinsulinemia

- » Insulin/IGF-1 Receptor Expression

- Influenced by Hyperglycemia

- » Carbohydrates and Insulin Secretion

- Influenced by Chronic Inflammation

Therapeutic Role of Ketogenic Diets

A photograph of a woman with curly hair smiling and hugging a child from behind. The image is overlaid with a semi-transparent white box containing text.

- Warburg effect
 - Inefficient use/ High use of Glucose
 - Aerobic Glycolysis
 - Starving cancer cells by limiting glucose access

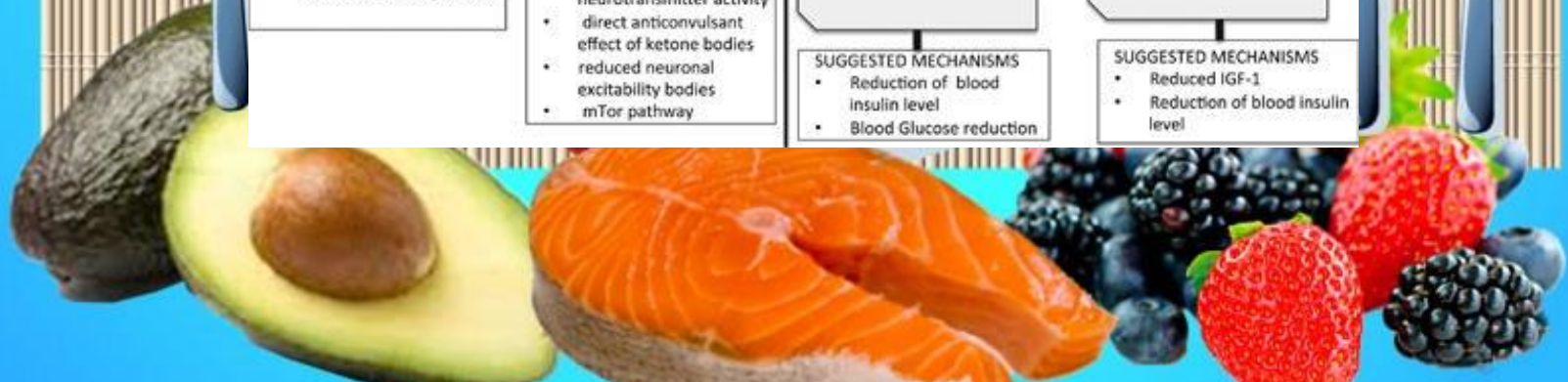
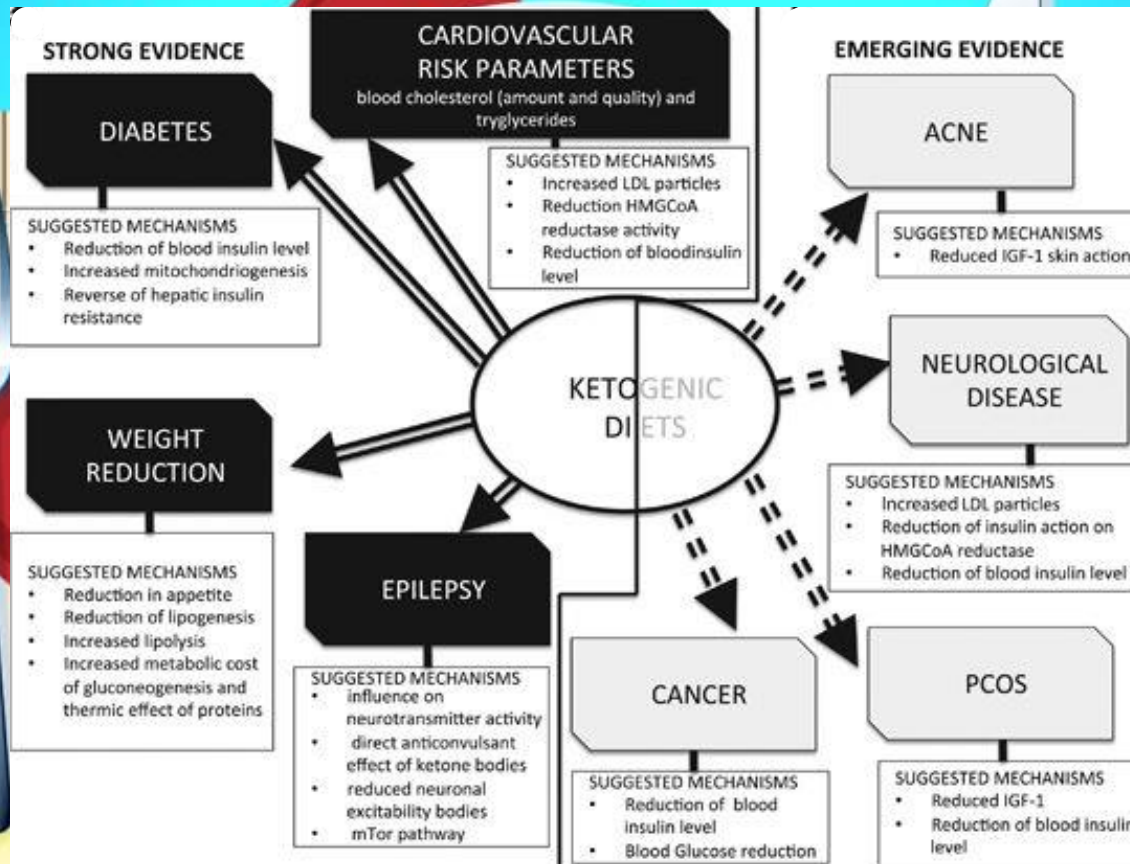
Therapeutic Role of Ketogenic Diets

- Emerging Evidence
 - Neurological disorders
 - Alzheimer's
 - Parkinson's
 - Headache
 - Autism
 - Brain Trauma
 - Amyotrophic Lateral Sclerosis

Therapeutic Role of Ketogenic Diets

- Neurological disorders
 - Ketones may be neuroprotective
 - Raising ATP levels
 - Reducing reactive oxygen species
 - Ketones may activate anticonvulsants
 - Ketones may improve mitochondrial function

The Ketogenic Diet



Functional Medicine Model and Ketogenic Diets



Integrative

Western

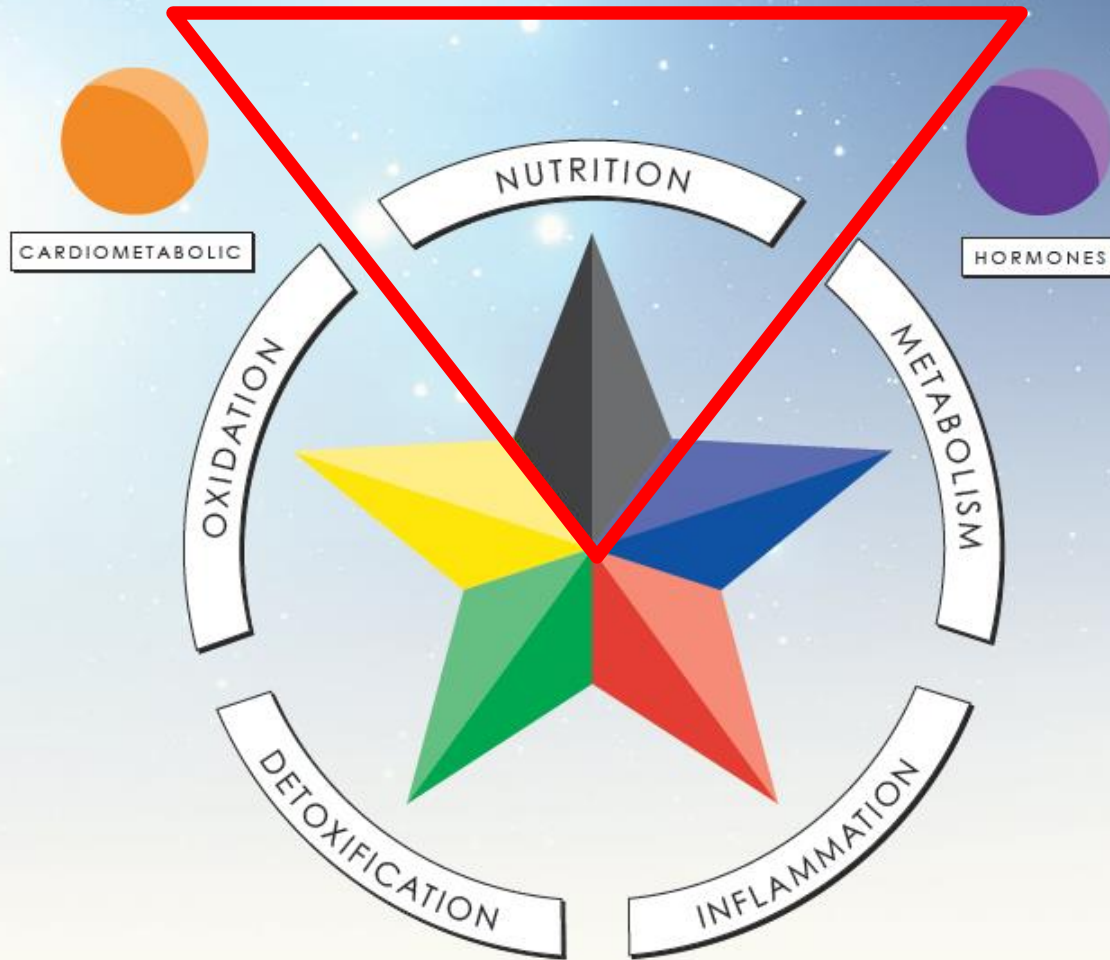
Allopathic

**Holistic
Medicine**

Integrated
Conventional
Scientific

Traditional

Evidence-Based



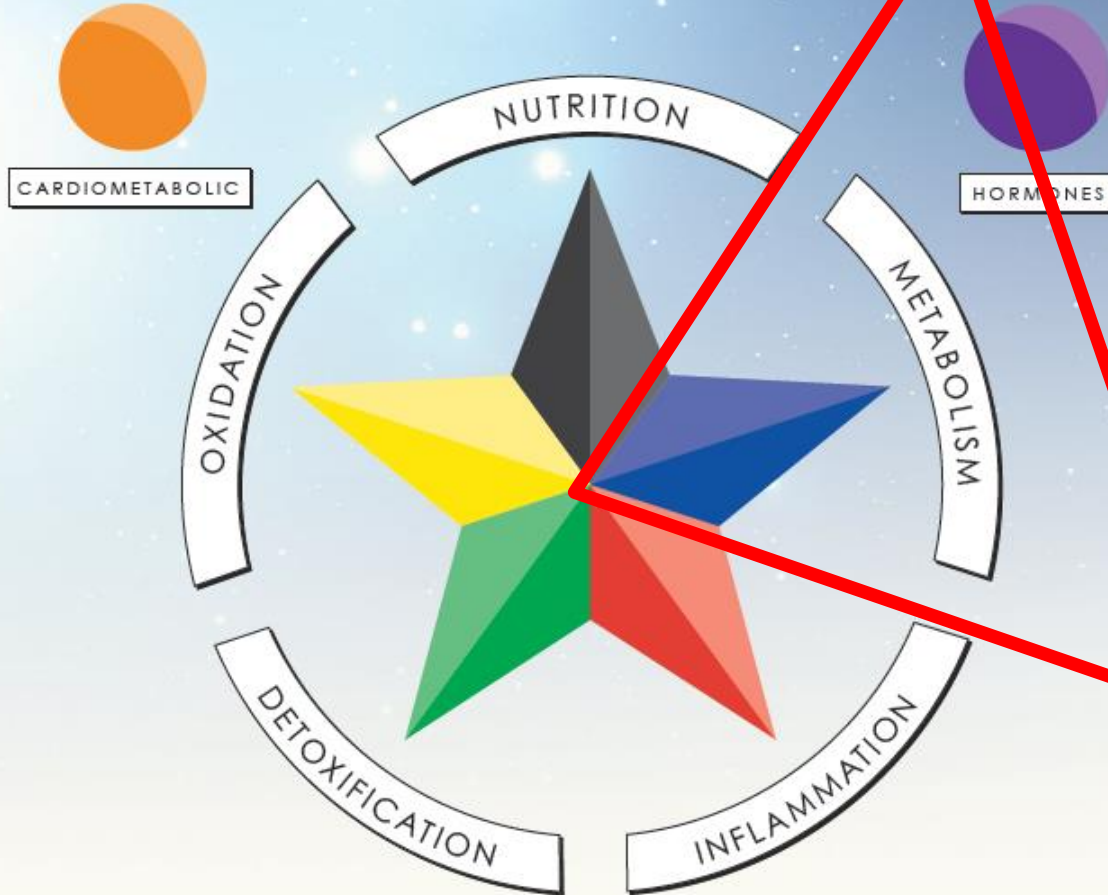
STAR OF WELLNESS

NUTRITION (Sticky)

- Caused by excess Sugar/Carbohydrates
- Standard American Diet
 - 50-65% Carbohydrates
- Processed and Refined Foods
- High Glycemic Index Foods
- Insulin Resistance / Metabolic Syndrome
- Inefficient metabolism of High Glycemic foods

NUTRITION (Sticky)

- Caused by excess Sugar/Carbohydrates
- KETOGENIC DIETS
 - Limit Carbohydrates
 - Fat Adaptive Metabolism
 - Macronutrients
 - Essential Amino Acids
 - Essential Fatty Acids
 - Micronutrients



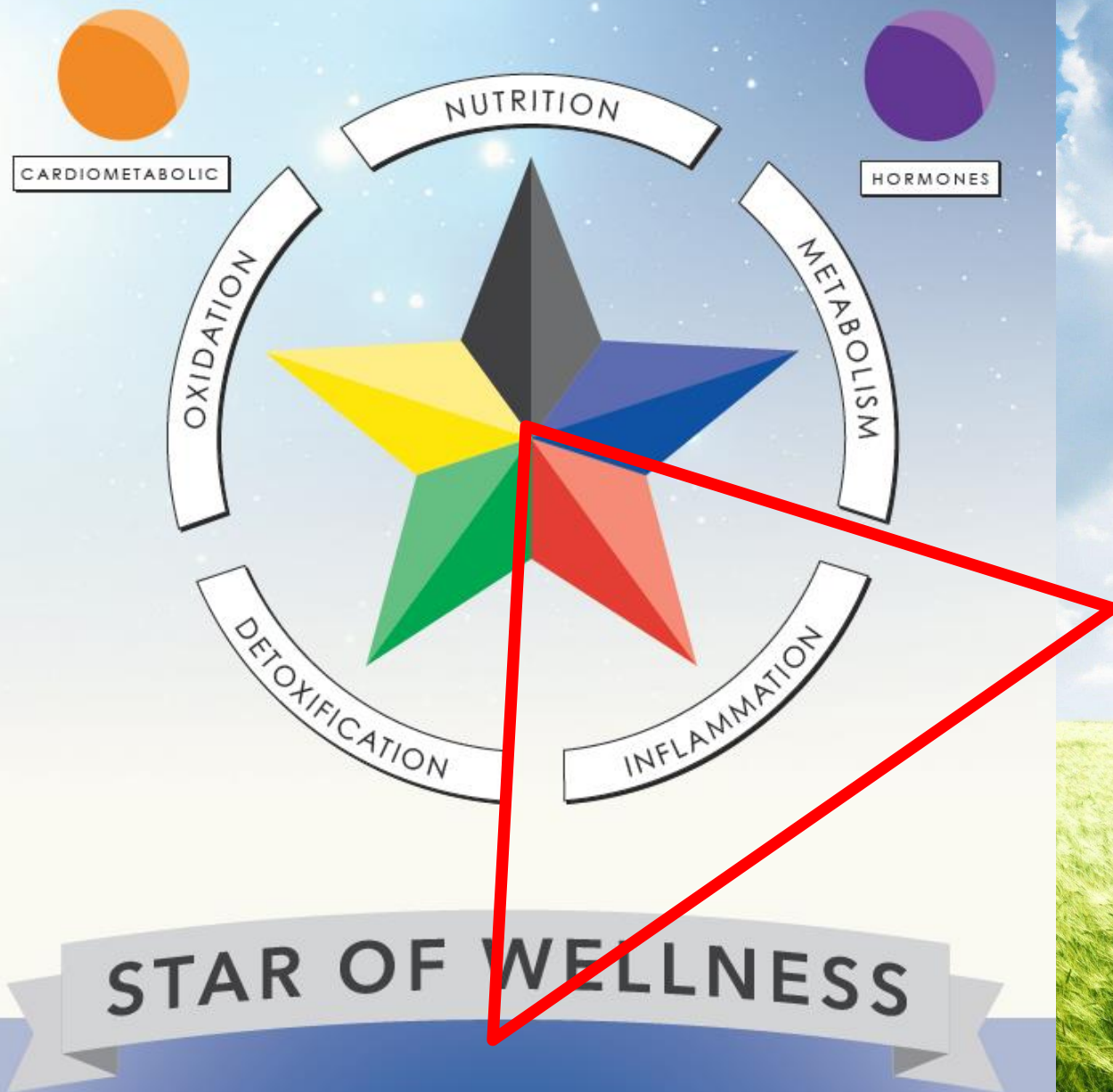
STAR OF WELLNESS

METABOLISM (Cold)

- Caused by Damaged or Sluggish Mitochondria
- Carbohydrate adaptive/dominance metabolism
- Poor protein intake
 - Enzymatic content for transport/metabolism
- Physical/chemical injury to mitochondria
 - Brain
 - Heart
 - Muscle

METABOLISM (Cold)

- Caused by Damaged or Sluggish Mitochondria
- KETOGENIC DIETS
 - Fat Adaptive Metabolism
 - High Efficiency for ATP
 - Mitochondria burn fatty acids cleaner than they burn carbohydrates
 - Generating ATP via fats/ketones produces fewer free radicals, because it's more efficient



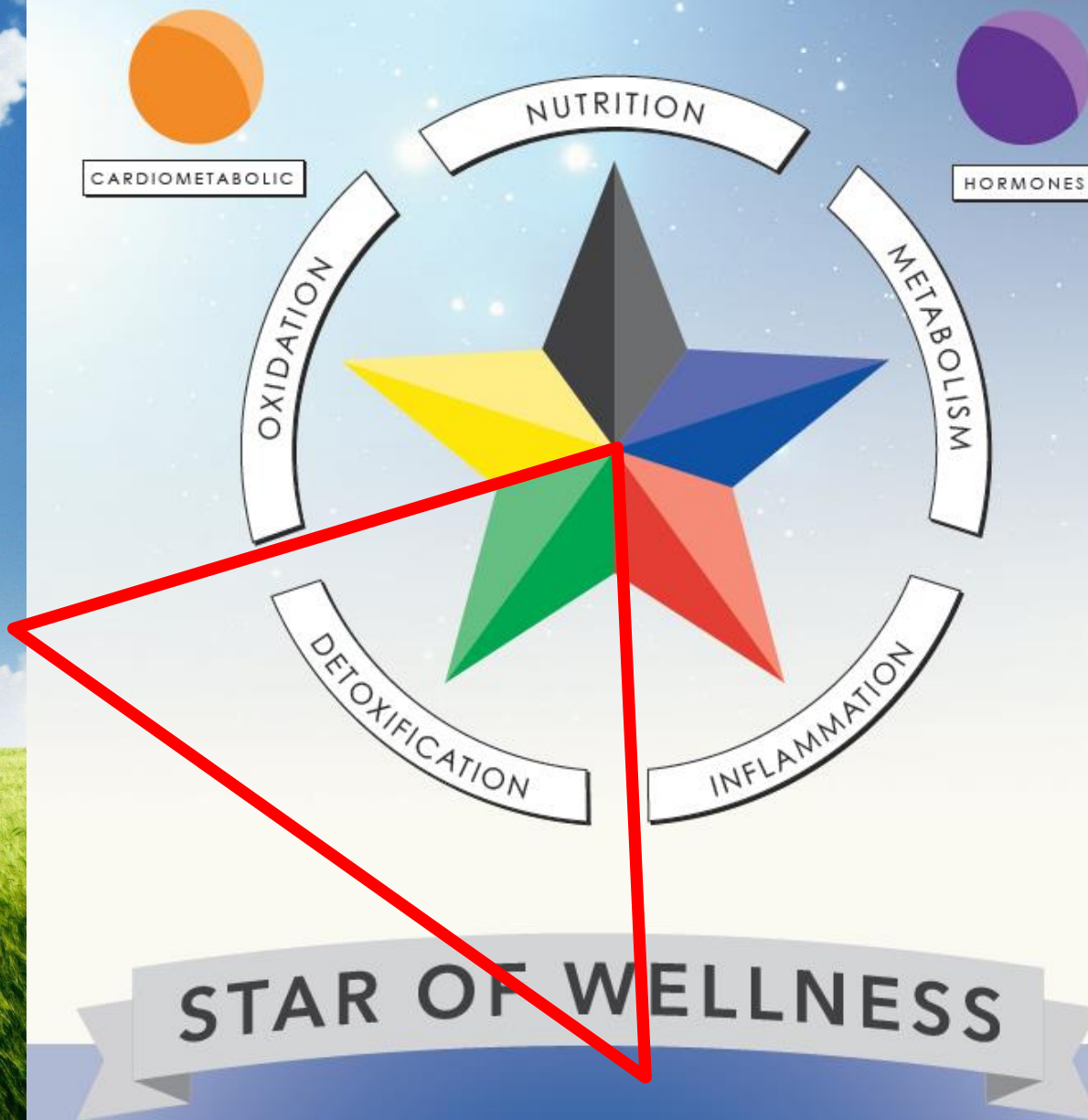
STAR OF WELLNESS

INFLAMMATION (Hot)

- Caused by Upregulation of Immune System and GI Dysregulation/Dysbiosis
- Gluten/Dairy/Sugar intake
 - Elimination Style Diets
- Genetically Modified Food (GMO) ?
- Pesticides/Herbicides
- Stress
- Sleep Deprivation

INFLAMMATION (Hot)

- Caused by Upregulation of Immune System and GI Dysregulation/Dysbiosis
- KETOGENIC DIETS
 - Removals of Refined Sugars
 - Removal of Grains/Gluten
 - Anti-Inflammatory Fats
 - Caution to monitor ratio of Anti- Inflammatory Fats to Inflammatory Fats (Ideal is 2:1 but can be higher)



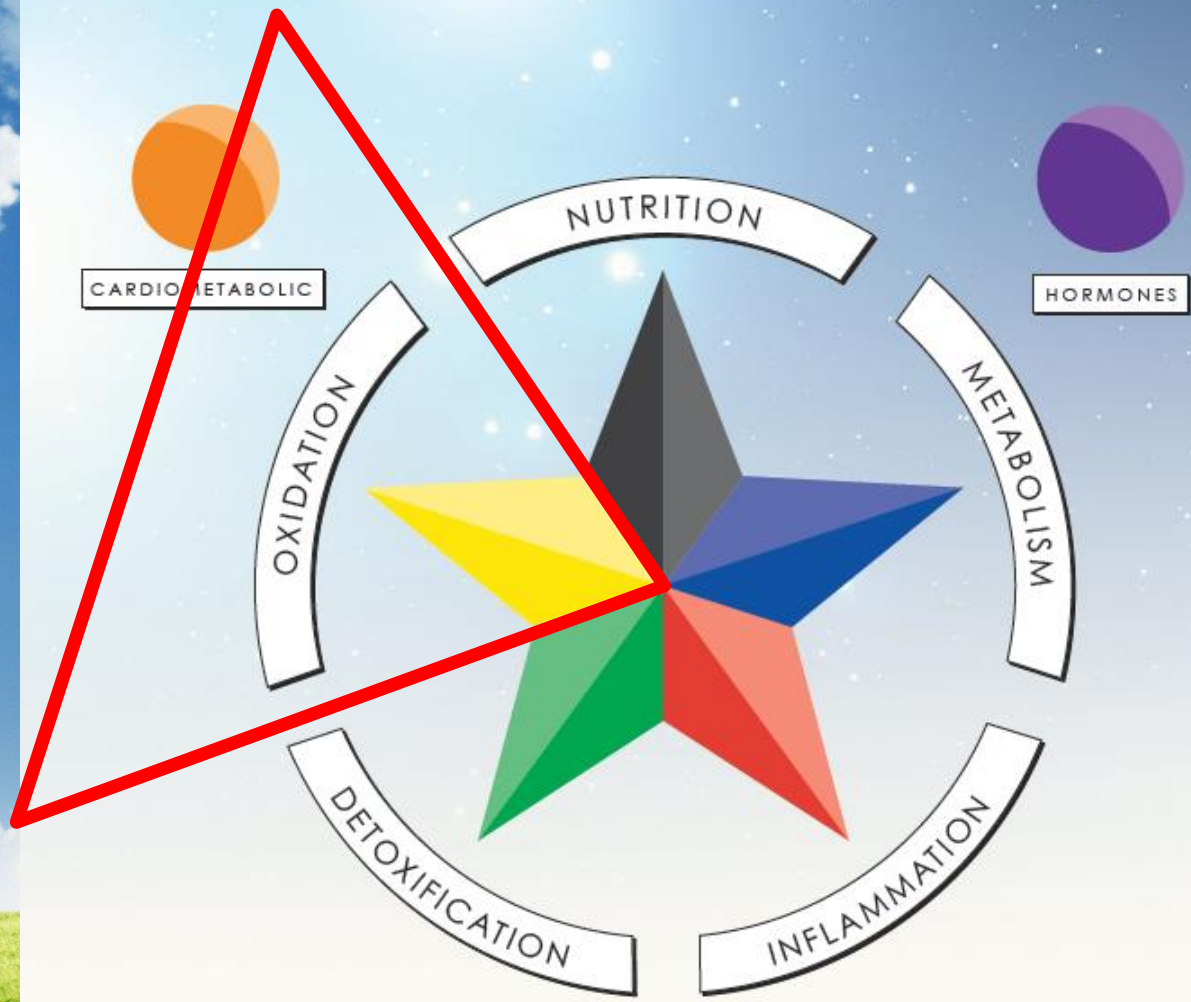
STAR OF WELLNESS

DETOXIFICATION (Dirty)

- Caused by exposures or poor clearance of toxic foods and substances
- Plastics/Pesticides/Polycarbonates/Paints/etc.
- Molds/Metals
- Poor Liver/Kidney function
- Poor Colon function
 - Low Fiber intake
 - Low Water intake

DETOXIFICATION (Dirty)

- Caused by exposures or poor clearance of toxic foods and substances
- KETOGENIC DIETS
 - Grass Fed/Free Range/Wild
 - Non-Starchy Vegetables
 - Inform participants about best sources



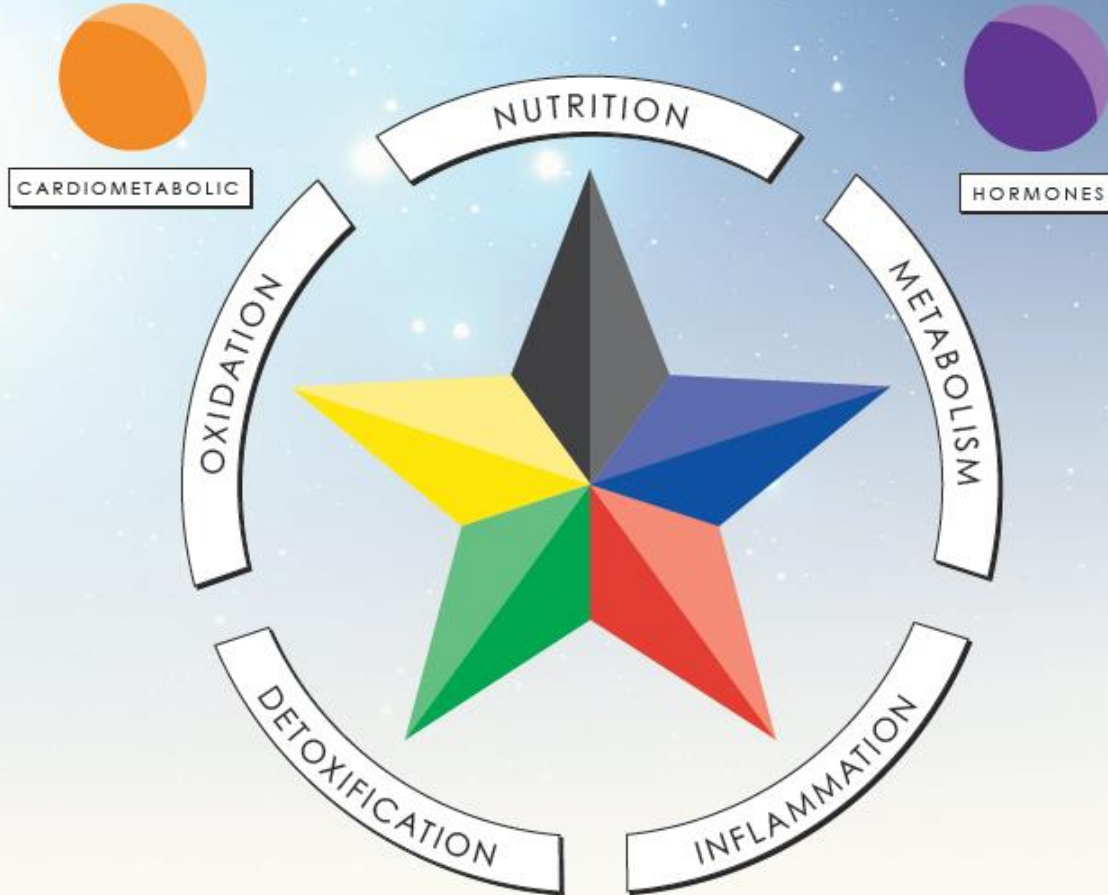
STAR OF WELLNESS

OXIDATION (Rusty)

- Caused by excessive exposure to free radicals and oxidative substances
- Carbohydrate adaptive/dominate diet
- Inefficient metabolism
 - Excess oxidation process
- Stress
- Sleep deprivation

OXIDATION (Rusty)

- Caused by excessive exposure to free radicals and oxidative substances
- KETOGENIC DIETS
 - Generating ATP via fats/ketones produces fewer free radicals, because it's more efficient
 - Initially MORE oxidative stress...but changes as insulin sensitivity improves
 - Caution in regards to inflammatory fats (ideal ratio)



STAR OF WELLNESS

Summary Points

- Review of Ketogenic Diets
- Therapeutic Roles of Ketogenic Diets
 - Strong Evidence
 - Weight Loss
 - Cardiovascular Disease
 - Type 2 Diabetes
 - Epilepsy



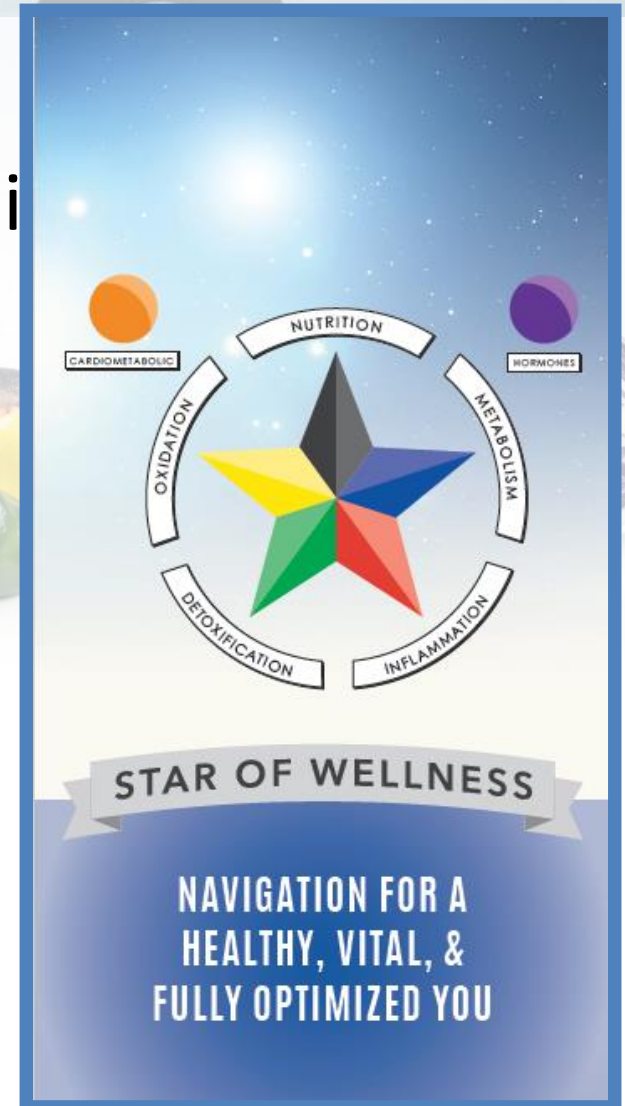
Summary Points

- Therapeutic Roles of Ketogenic Diets
 - Emerging Evidence
 - Acne
 - Polycystic Ovarian Disease
 - Cancer
 - Neurological Diseases



Summary Points

- Therapeutic Roles of Ketogenic Diet
 - Functional Medicine Model
 - Nutrition
 - Metabolism
 - Inflammation
 - Detoxification
 - Oxidation



KETO



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