



—
The *voice* of the
community
pharmacist.

Food is Medicine: Using 'Farmacology' to Empower Wellness

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Clinical Community Pharmacist DrKathy Health LLC

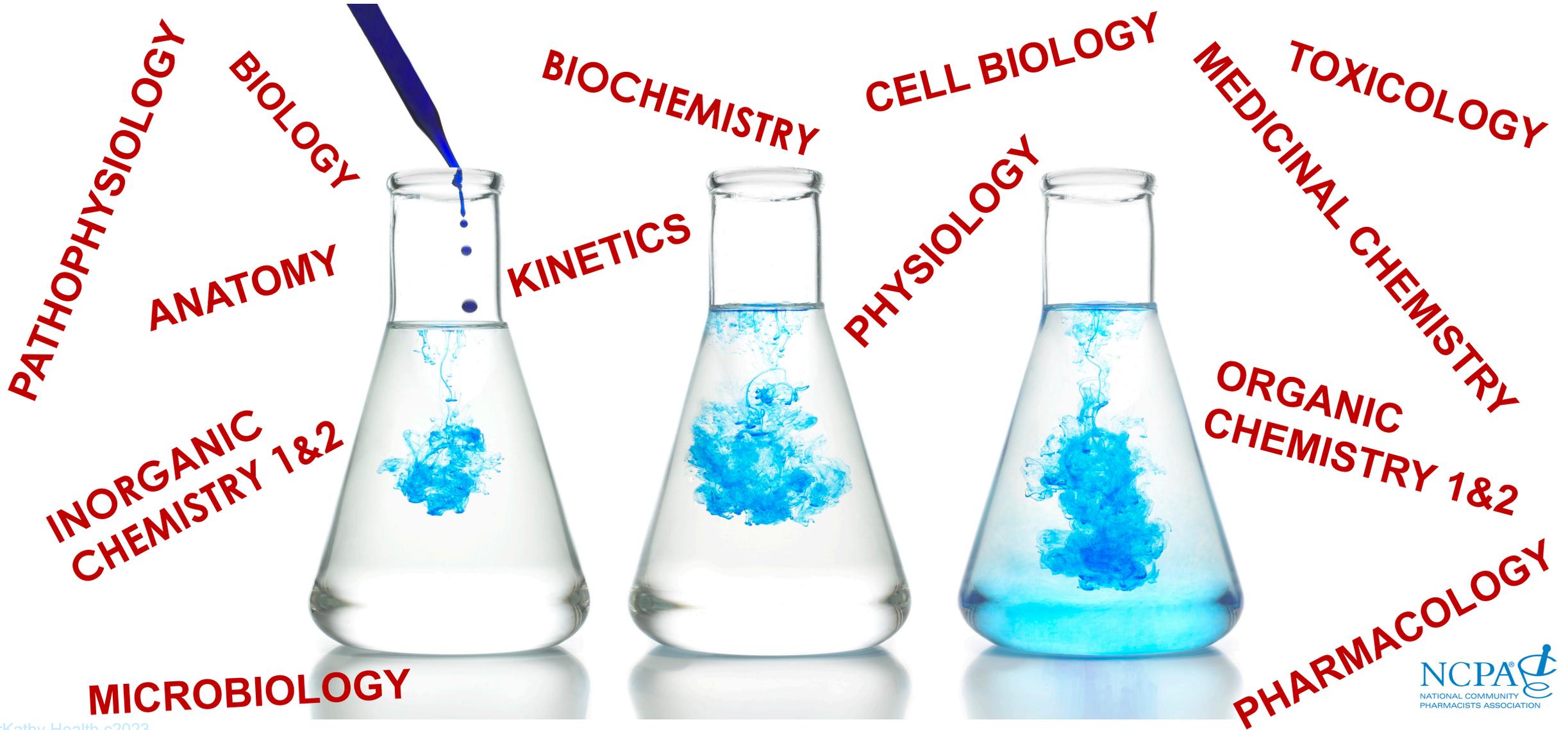
Owasso Wellness Pharmacy & Compounding

Pharmacist and Technician Learning Objectives

1. Summarize two mechanisms by which food impacts drug effectiveness.
2. Define a 'plant-focused' eating approach.
3. Review three nutrition-focused product offerings for your pharmacy.



THE MAKING OF A PHARMACIST



A white computer keyboard is visible in the upper left corner, partially obscured by a black stethoscope. The stethoscope is positioned diagonally across the frame, with its chest piece resting on the keyboard and its earpieces extending towards the bottom right. The background is a plain white surface.

The Pharmacist's Advantage

The pharmacist is trained in altering **metabolic function** with the selection, creation, dispensing, monitoring and adjusting of therapeutic interventions in order to achieve optimal health outcomes.



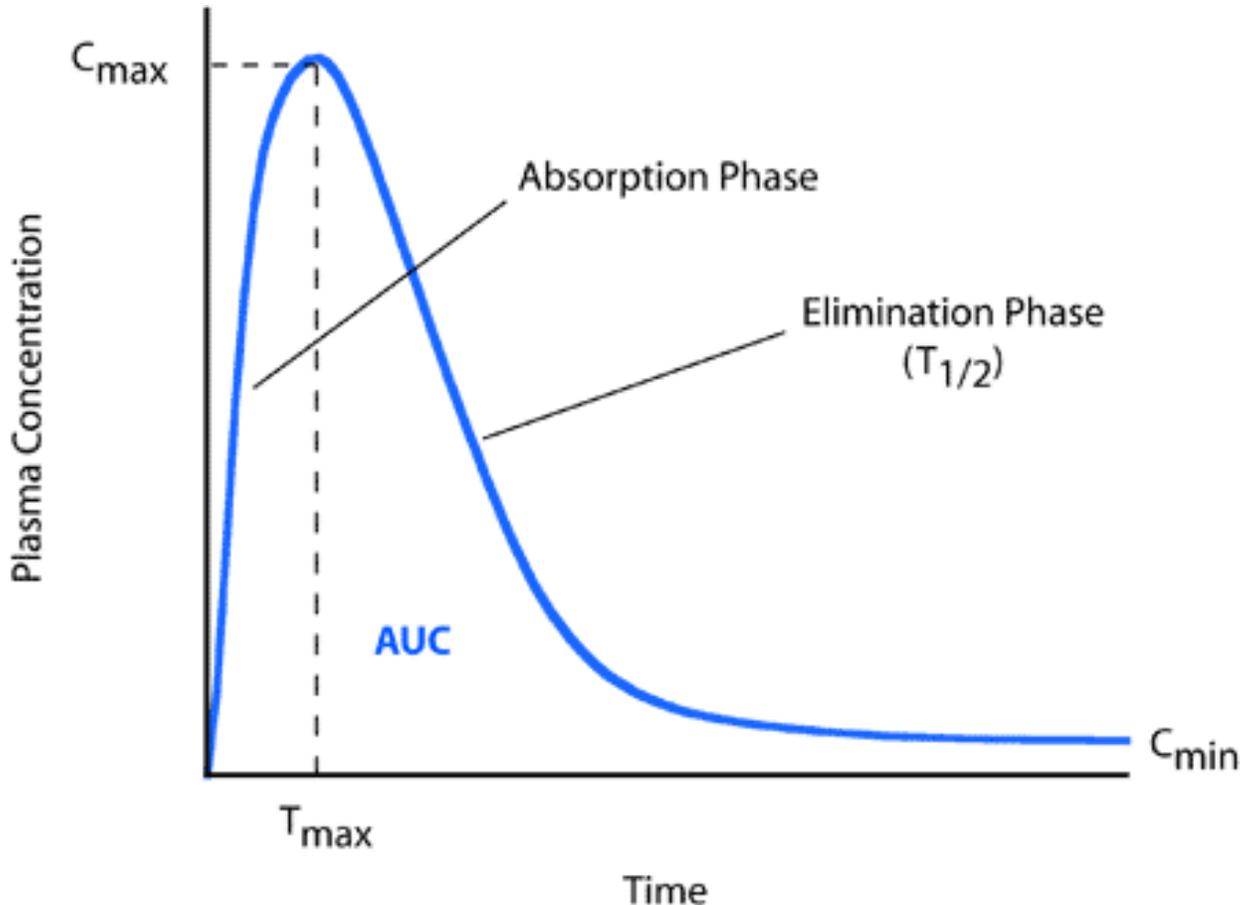
Pharmacology

-a branch of medicine, biology, and pharmaceutical sciences concerned with drug or medication action, where a drug may be defined as **any artificial, natural, or endogenous molecule** which exerts a biochemical or physiological effect on the cell, tissue, organs, or organism. Wikipedia

Pharmacokinetics-*Greek 'Drug movement'*

The effect the body has on medications

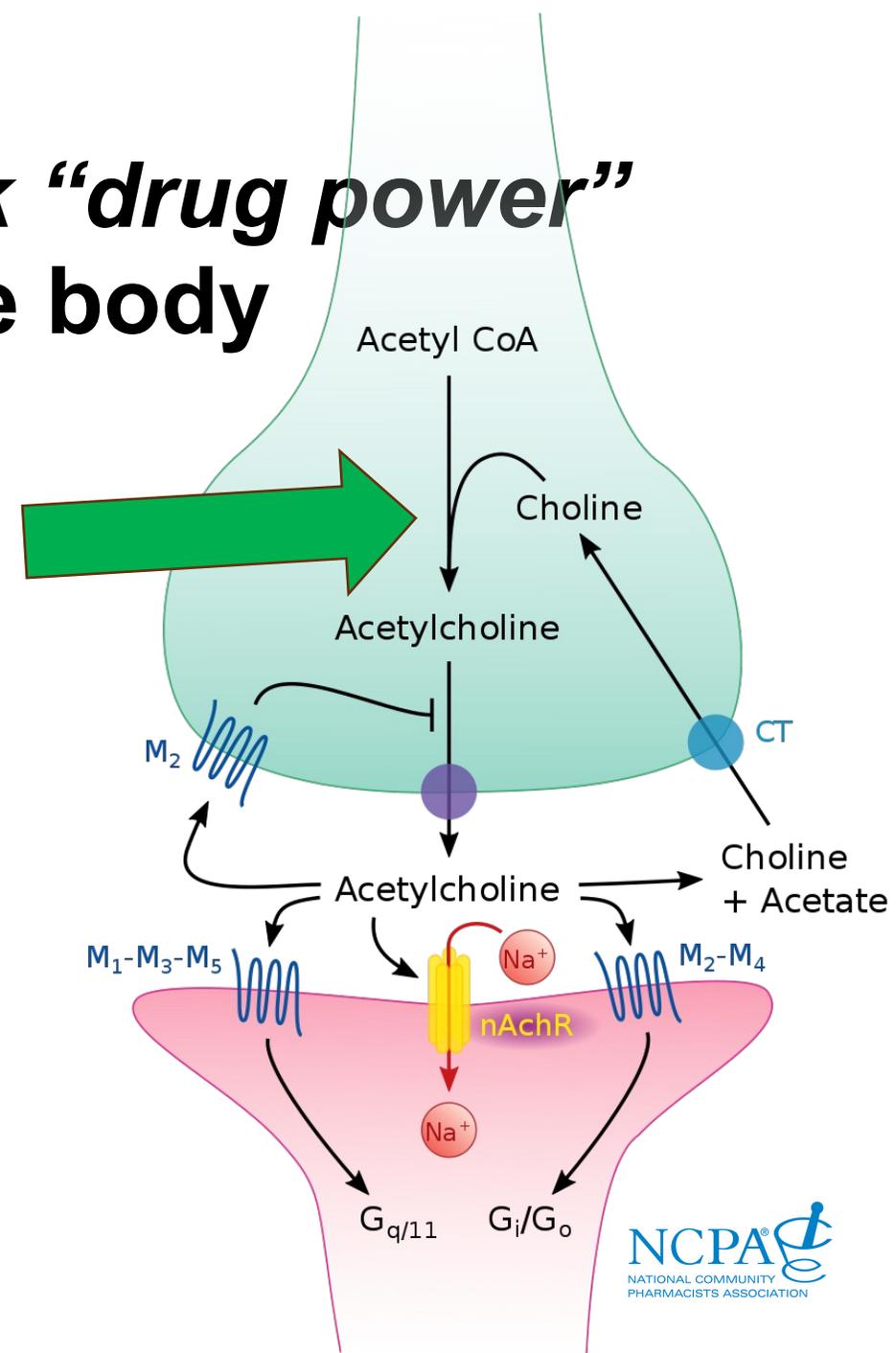
- Absorption
- Distribution
- Metabolism
- Excretion



Pharmacodynamics- Greek “drug power”

The effects of medications on the body

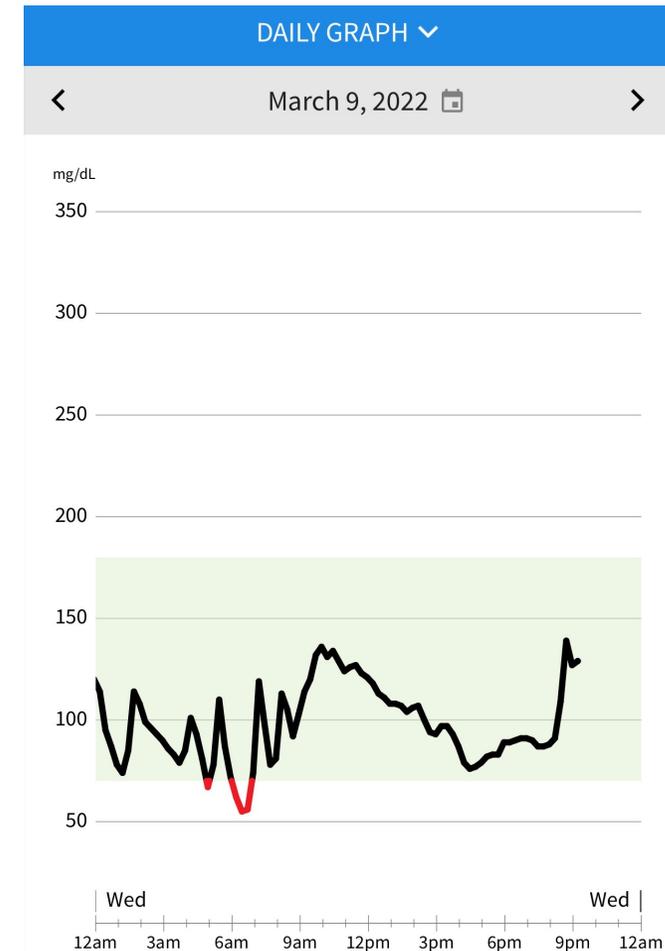
The study of the biochemical and physiological effect of a drug and their mechanisms of actions at the organ system/sub cellular/macro cellular levels.



“Farmacology”

...as an adjunct to diet and exercise.

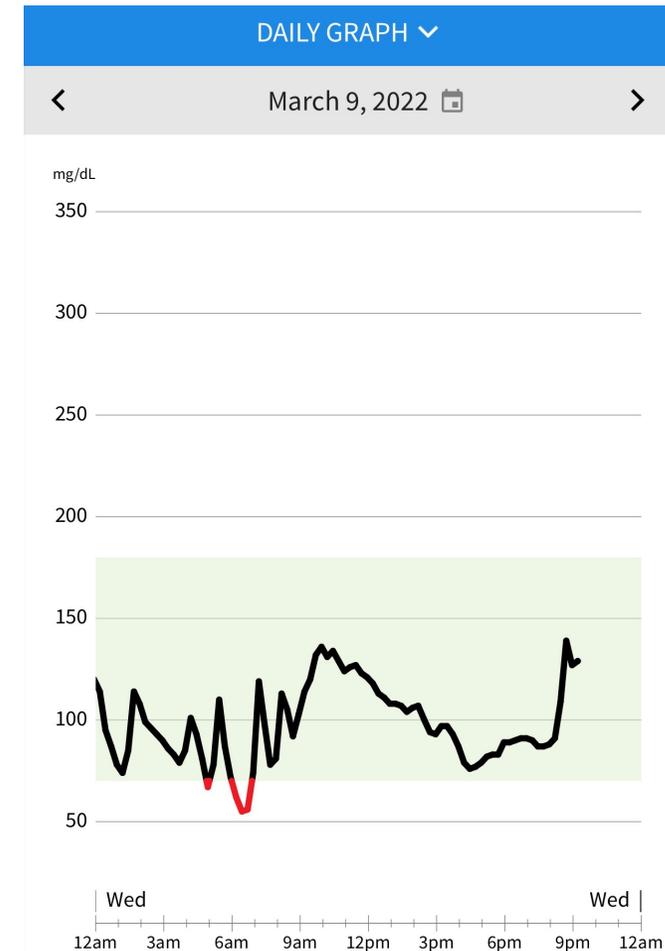
The kinetic and dynamic effects of ‘food’ chemistries on metabolic function, health span, disease processes, therapeutics as well as on therapeutic outcomes.



“Farmacology”

...as an adjunct to diet and exercise.

The kinetic and dynamic effects of ‘food’ chemistries on metabolic function, health span, disease processes, therapeutics as well as on therapeutic outcomes.



Food is Chemistry

“Our understanding of how diet affects health is limited to 150 key nutritional components that are tracked and catalogued by the United States Department of Agriculture and other national databases. Although this knowledge has been transformative for health sciences, helping unveil the role of calories, sugar, fat, vitamins and other nutritional factors in the emergence of common diseases, these nutritional components represent only a small fraction of the more than 26,000 distinct, definable biochemicals present in our food—many of which have documented effects on health but remain unquantified in any systematic fashion across different individual foods.”



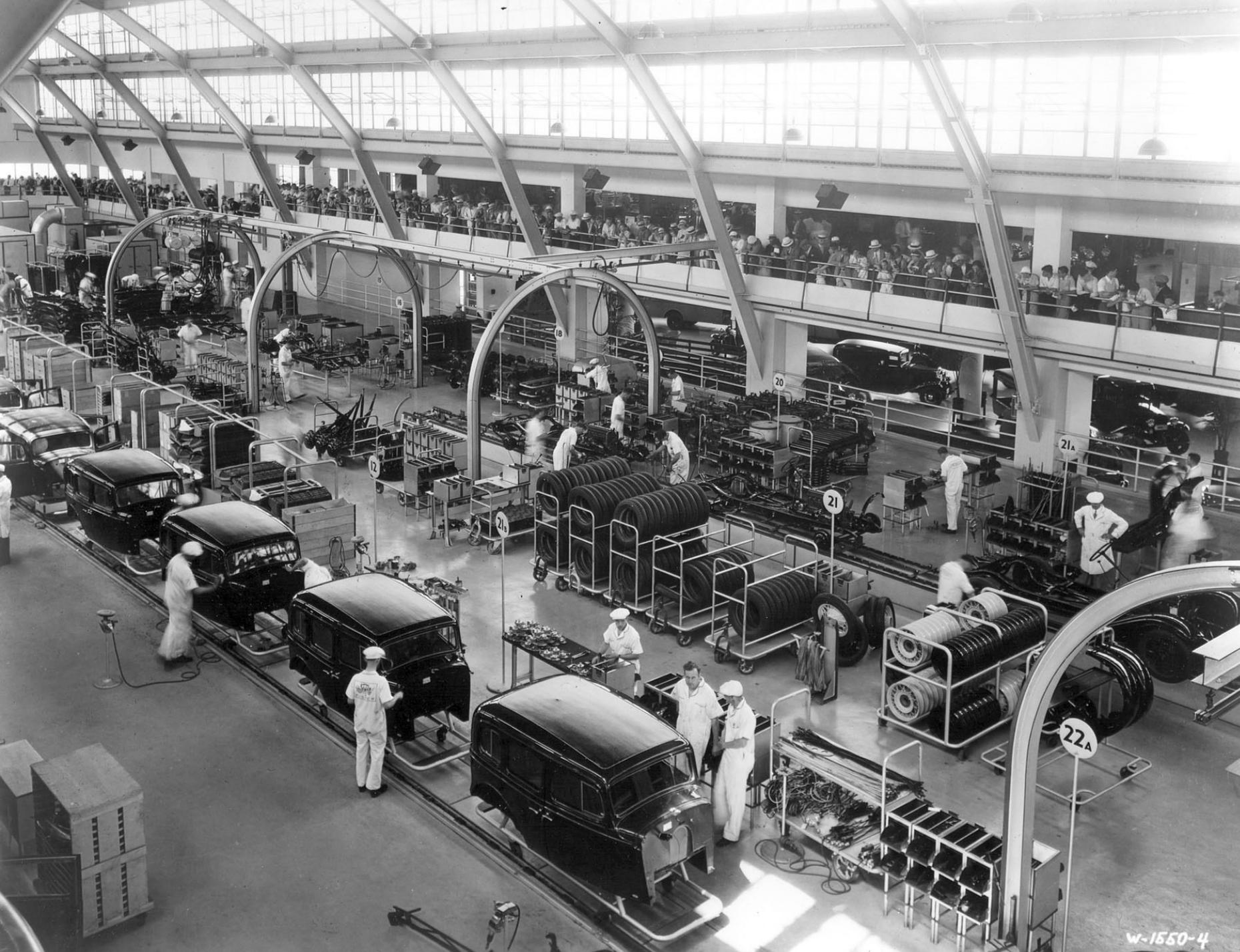
Food is Chemistry

- Currently, **26,625** distinct biochemical compounds have been identified in food.
- The number of secondary metabolites is estimated to exceed 49,000 compounds, indicating that the 26,000 chemicals currently assigned to food represent an incomplete assessment of the true complexity of the ingredients we consume.





Metabolism refers to the whole sum of reactions that occur throughout the body within each cell and that provide the body with energy.



The Cellular Factory

The Cellular Factory

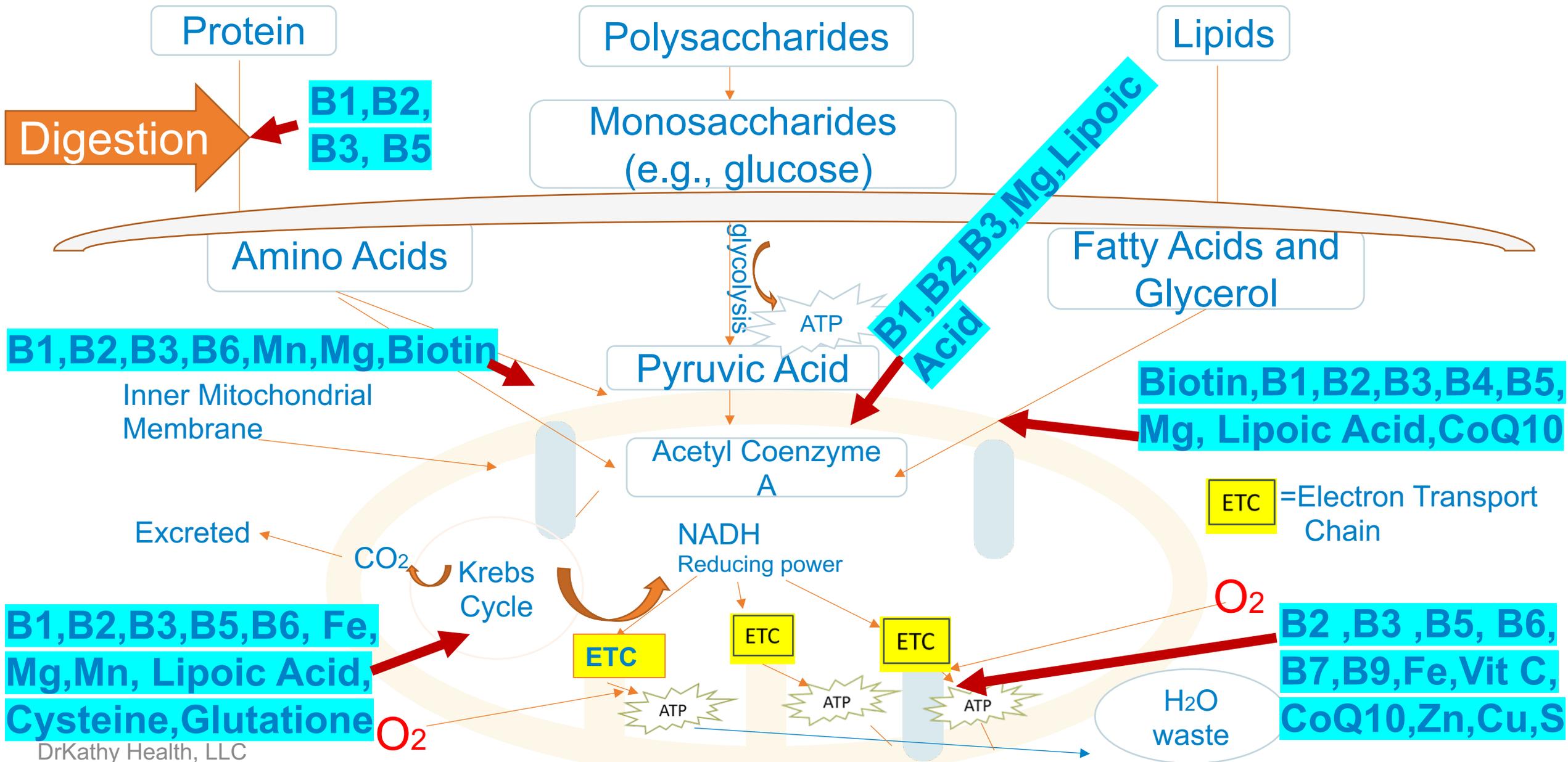
- **Phase one** is digestion of foods into small molecules.
- **Phase two**, all the small molecules undergo incomplete oxidation. Oxidation is the removal of electrons or hydrogen atoms. The end-product of these processes is water and carbon dioxide, and three principal substances, namely: acetyl coenzyme A, oxaloacetate, and alpha-oxoglutarate. Of these, the most common compound is **acetyl coenzyme A**, which forms 2/3 of the carbon in carbohydrates and glycerol, all the carbon in fatty acids, and half the carbon in amino acids.

The Cellular Factory

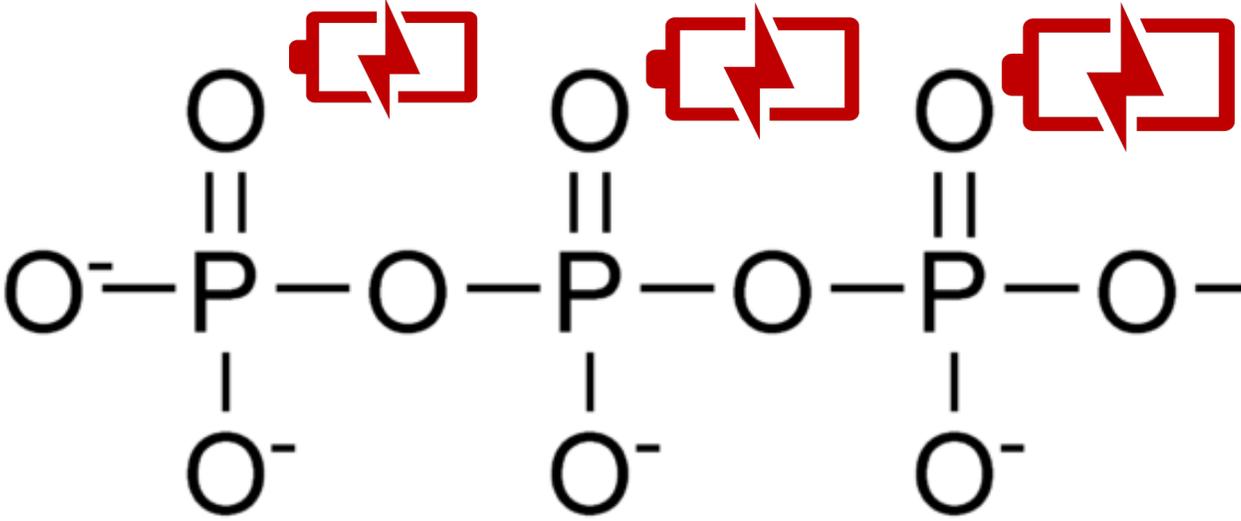
- The **third and final phase** of this process occurs on a cycle called the Krebs cycle, discovered by Sir Hans Krebs. In this cycle, acetyl coenzyme A and oxaloacetate come together and form citrate. In this stepwise reactions, occurs a liberation of protons, which are transferred to the respiration chain to synthesize ATP.

Sánchez López de Nava A, Raja A. Physiology, Metabolism. [Updated 2022 Sep 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK546690/>

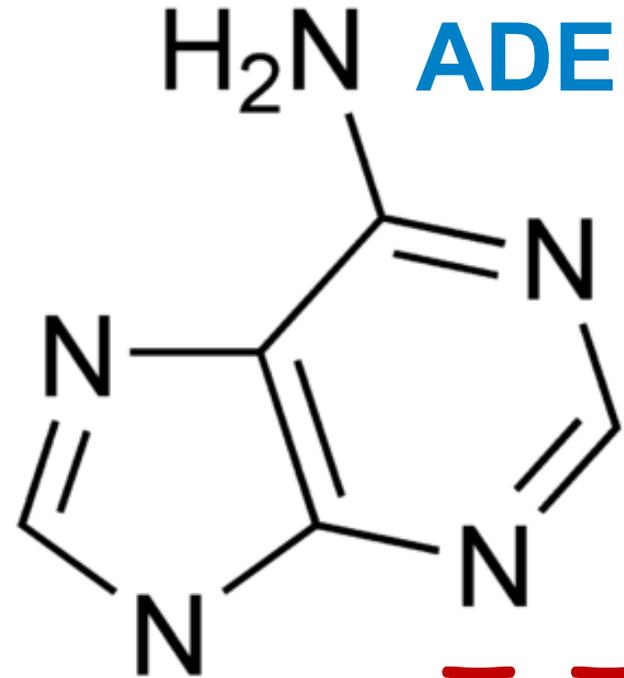
Mitochondrial energy production (from food)



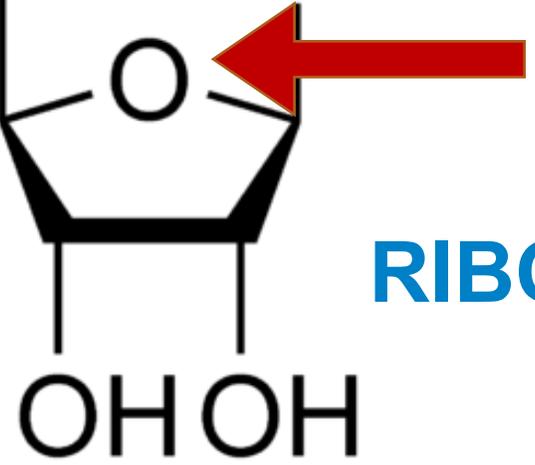
ATP-ADENOSINE TRIPHOSPHATE



TRIPHOSPHATE



H₂N ADENINE



LIFE

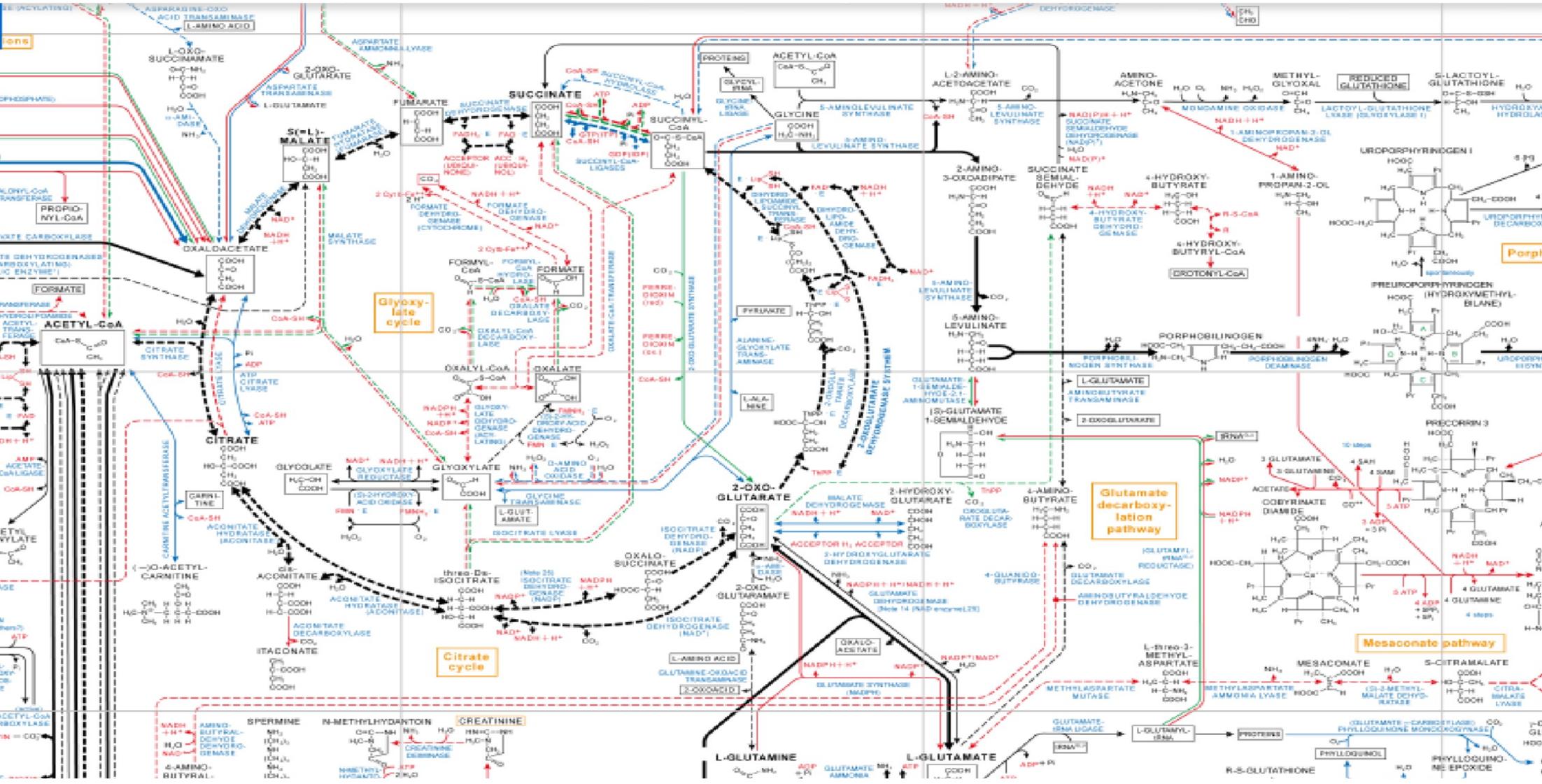
RIBOSE

Part 1

Metabolic Pathways



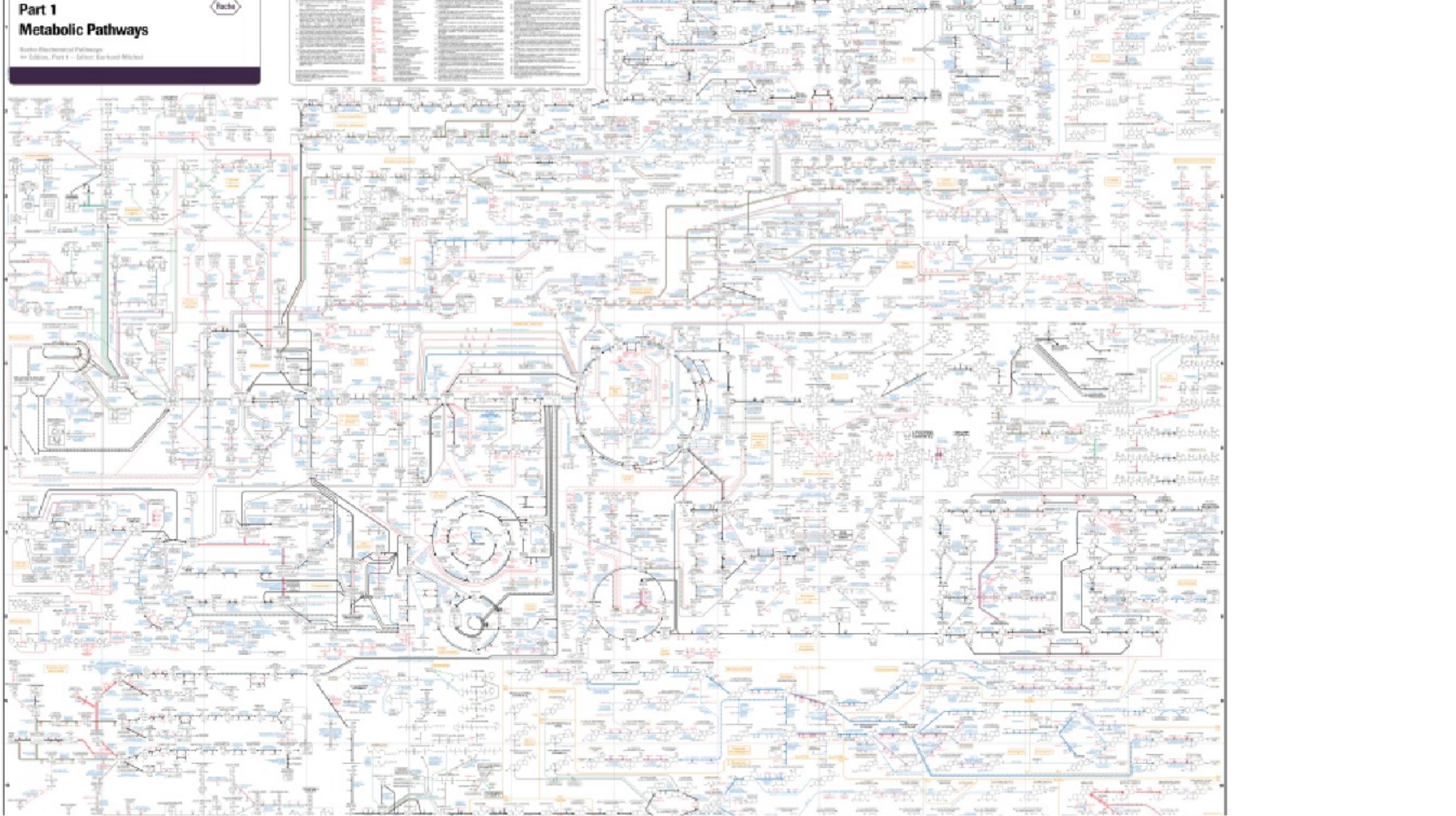
Roche Biochemical Pathways
4th Edition, Part 1 – Editor: Gerhard Michal



Part 1 Metabolic Pathways

Second Edition, Part 1 - Editor: Garland Mitchell

Back

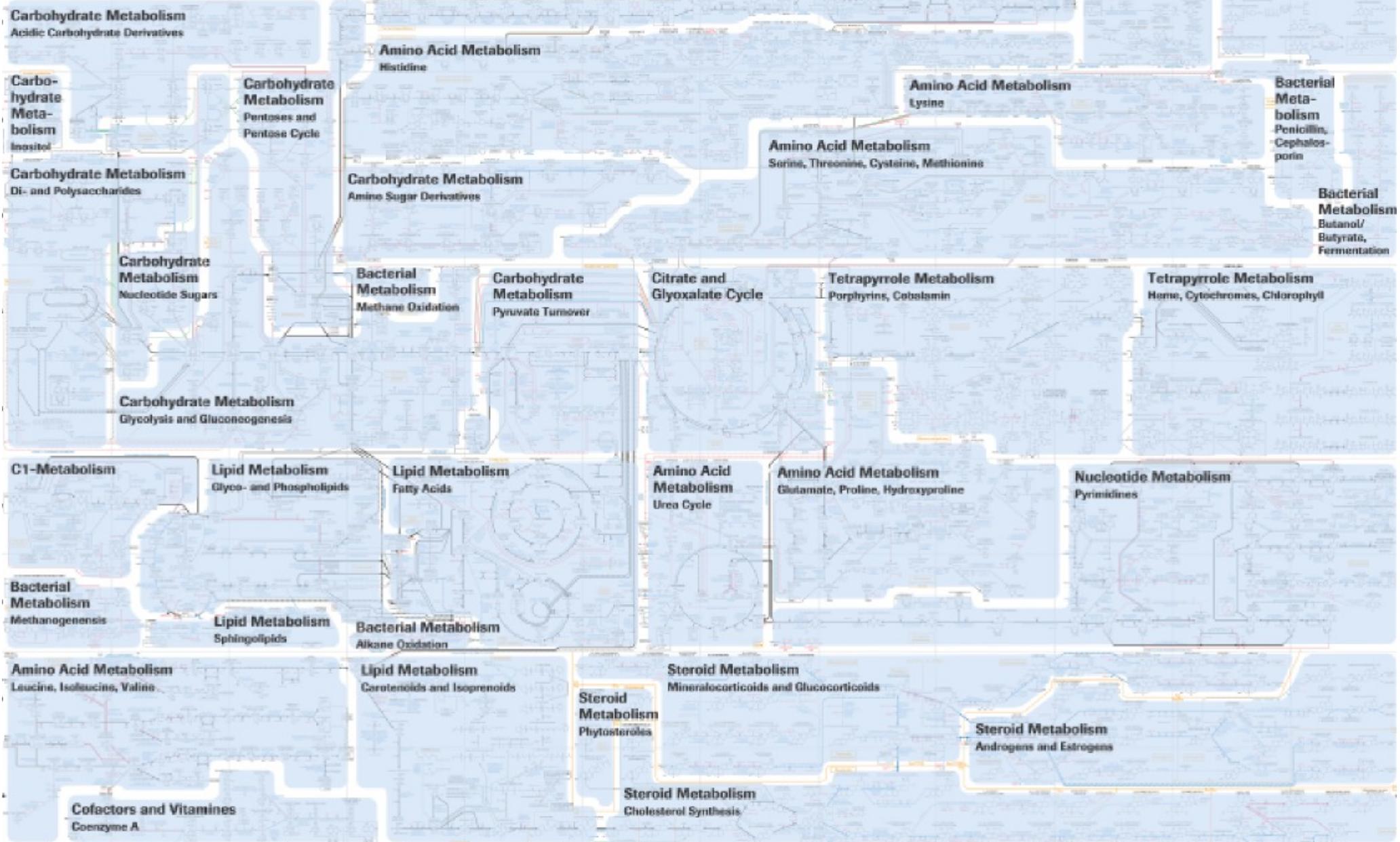


Part 1 Metabolic Pathways

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Book: Biochemical Pathways
4th Edition, Part 1 - Editor: Garfield Merfeld

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100	Metabolic Pathways



What is foundational to optimal ATP production mitochondrial function?

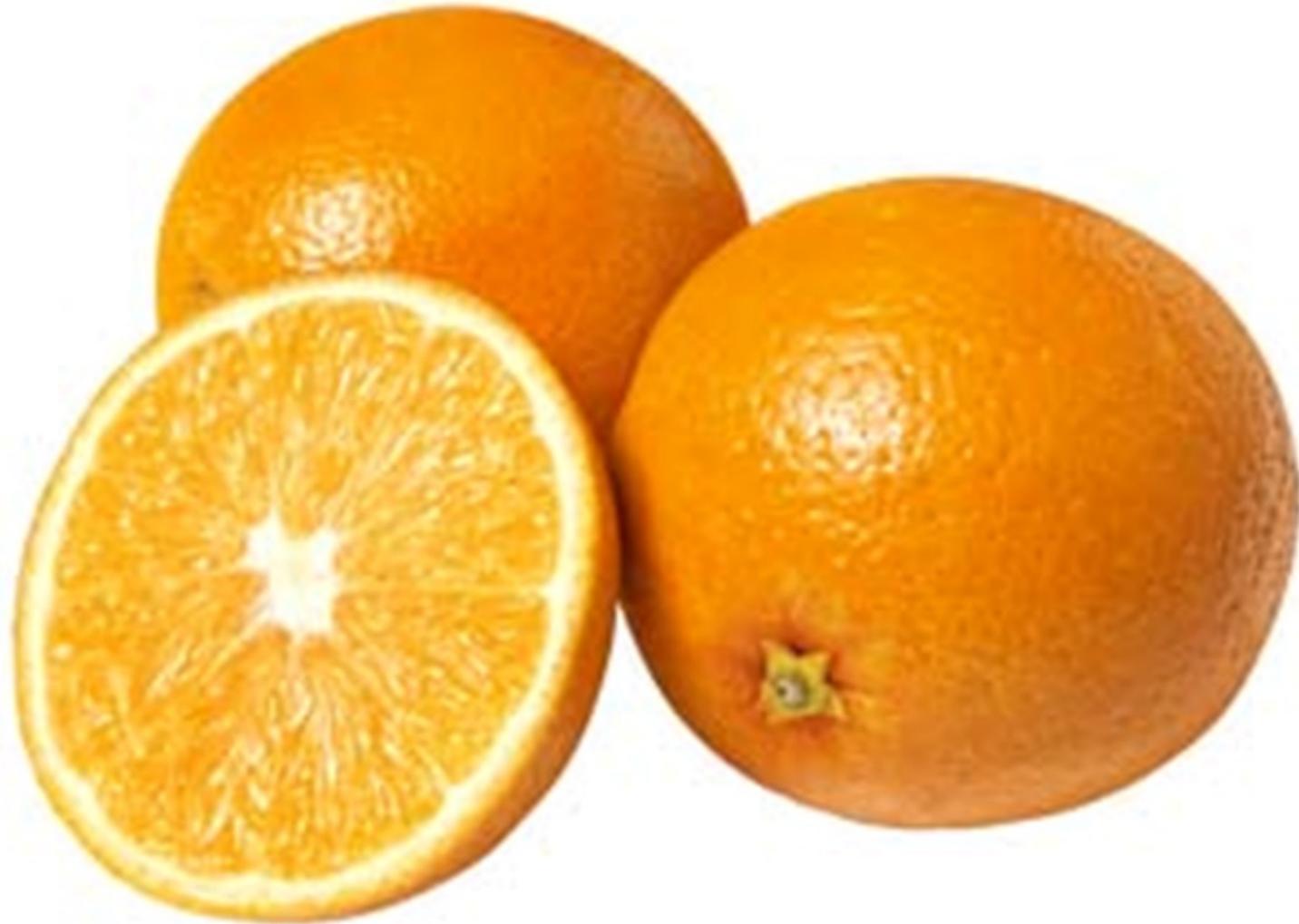
FOOD-the foundational chemistry of life

- *Acquired, digested, absorbed, metabolized, distributed* into tissue, into cell, through cytoplasm to mitochondria
- Large amounts of nutrients and co-factors **inside of the cell**



NUTRIENTS

Foods or liquids that supply the body with the chemicals necessary for metabolism.



What are we eating??

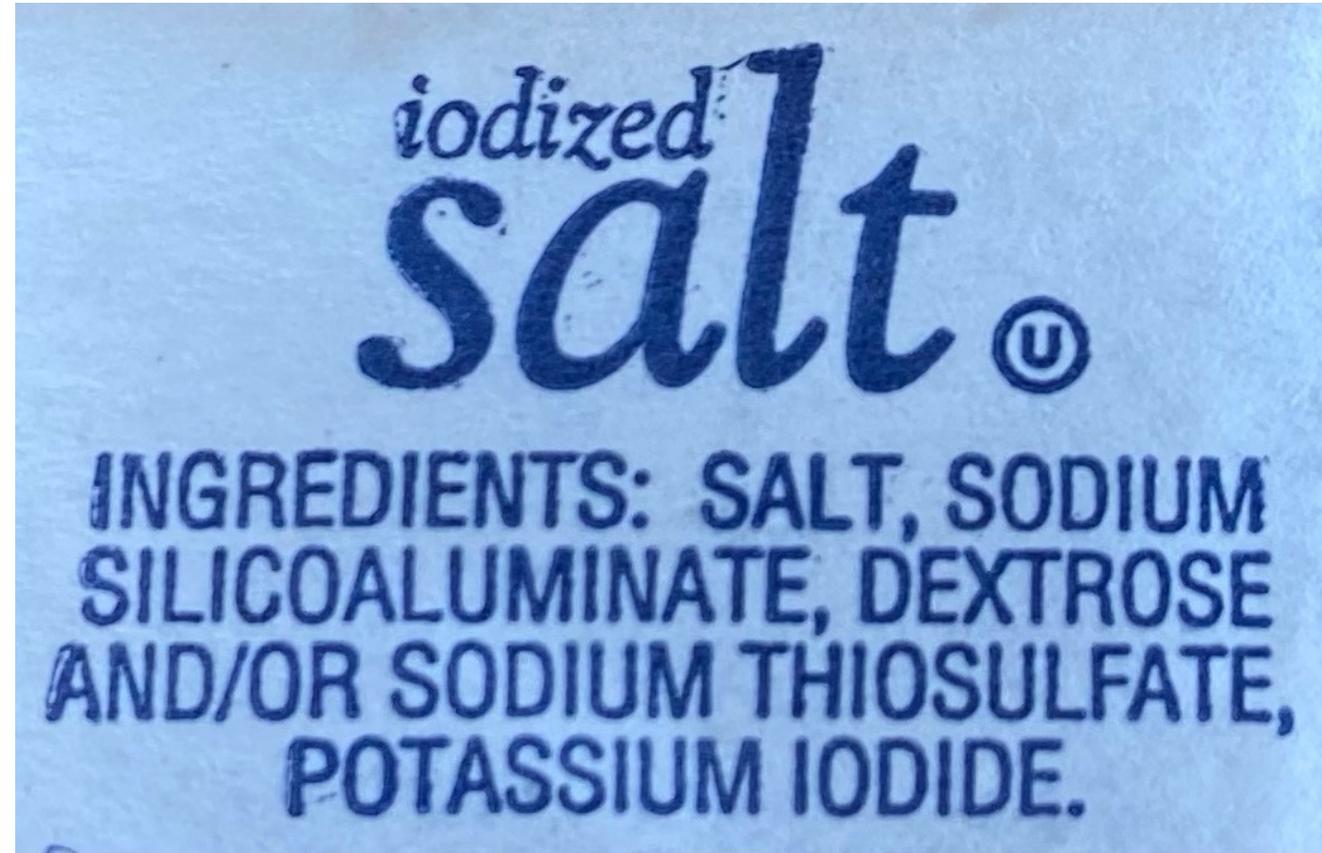
“Overall, the proportion of calories in youths’ diets that came from ultra-processed foods rose between 1999 to 2018, from about 61% to 67%. The proportion from whole, unprocessed foods dropped from almost 29% to 23.5% during the same time period.”

<https://www.nih.gov/news-events/nih-research-matters/highly-processed-foods-form-bulk-us-youths-diets>



Metabolically Deficient and Toxic

The Standard American Diet (Culture) lacks the necessary biochemistries sufficient to populate metabolic processes, while at the same time containing chemistries disruptive or toxic to metabolic processes.



**“All things are poison, and
nothing is without poison;
the dosage alone makes it so
a thing is not a poison.”**

-Paracelsus



NUTRIENT DEFICIENCY

An inadequate supply of nutrients from the **lack of consumption or absorption** in the diet resulting in malnutrition or disease

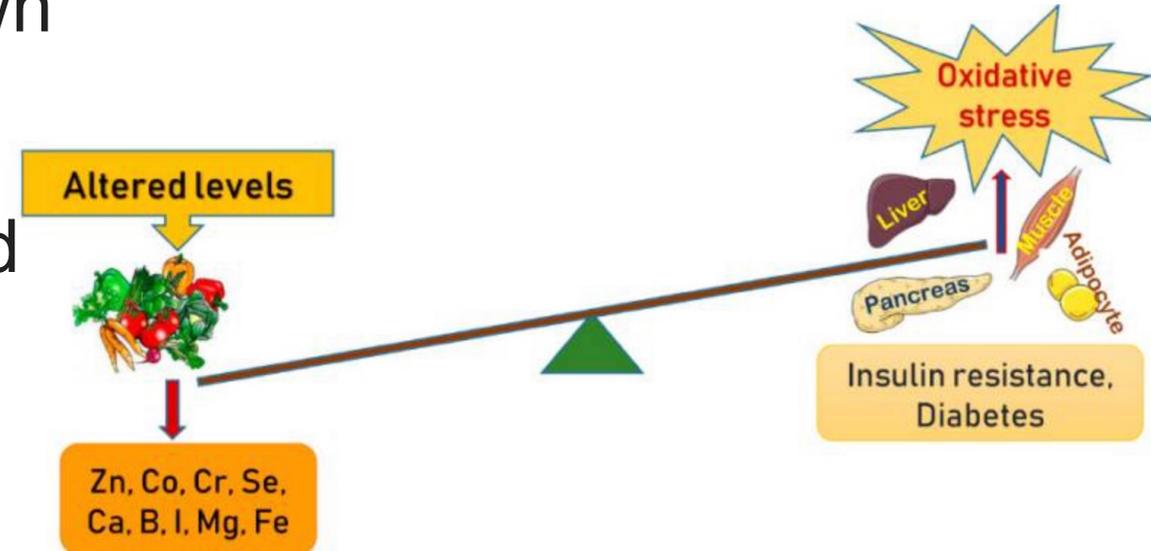


The sub-clinical stages of marginal micronutrient deficiency

Stage	Etiology	Evidence
<u>Stage 1</u>	<u>Depletion of vitamin stores</u>	<u>• Measurement of vitamin/mineral levels in blood or tissues</u>
<u>Stage 2</u>	<u>Non-specific biochemical adaptation.</u>	<u>• Decreased excretion of metabolites in the urine</u>
<u>Stage 3</u>	<u>Secretion of micronutrient dependent enzymes or hormones reduced</u>	<u>• First physical signs; lack of energy, malaise, loss of appetite, insomnia</u>
<u>Stage 4</u>	<u>Reversible impairment of metabolic pathways and cellular function</u>	<u>• Metabolic, metabolic or functional disturbances</u>
<u>Stage 5</u>	<u>Irreversible tissue damage</u>	<u>• Clinical signs of micronutrient deficiency</u>

Diabetes and Nutrient Deficiency

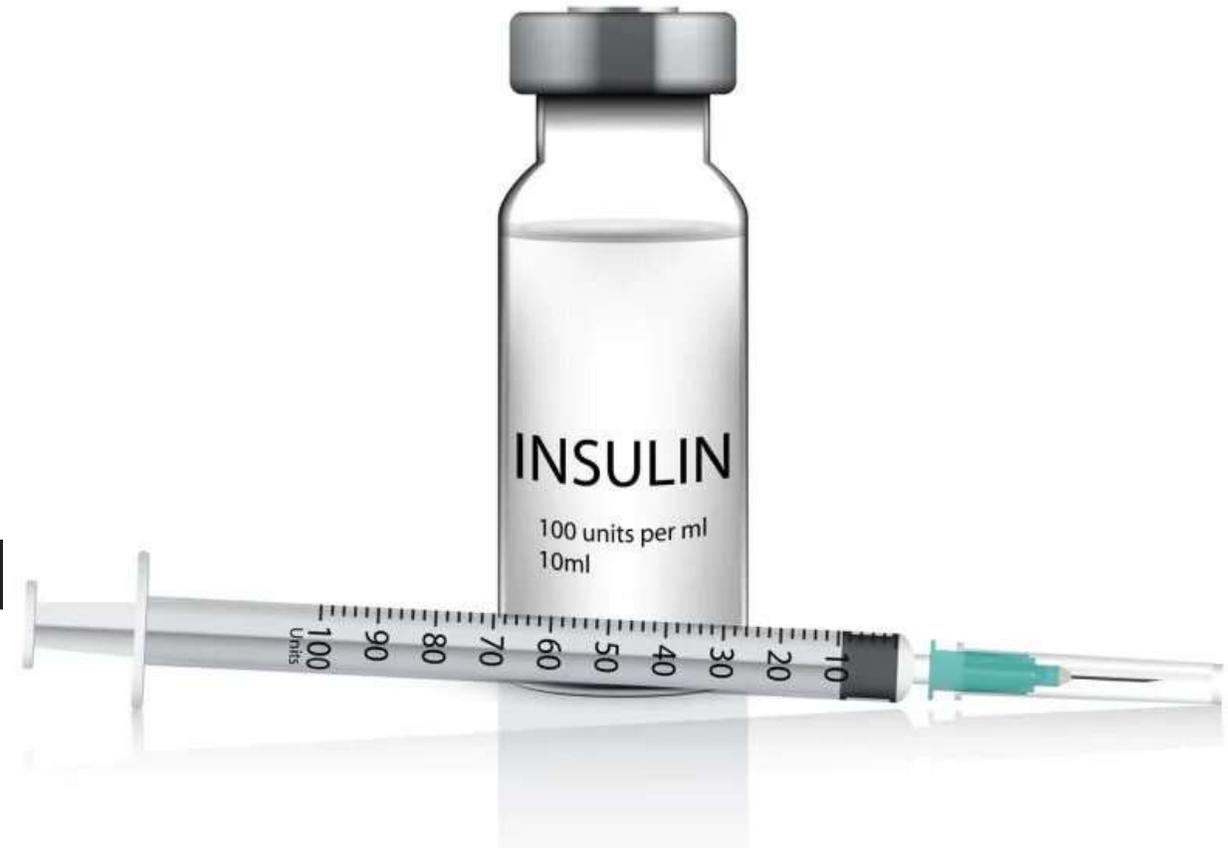
- Although some micronutrients are known to be involved in the pathogenesis and progression of diabetes mellitus, others may only be a consequence of depleted or altered carbohydrate intolerance and insulin resistance.



- **Magnesium** is a cofactor required for movement of glucose into the cell and for carbohydrate metabolism. It is involved in the cellular activity of insulin. Low magnesium intake is a risk factor for diabetes.

Diabetes and Nutrient Deficiency

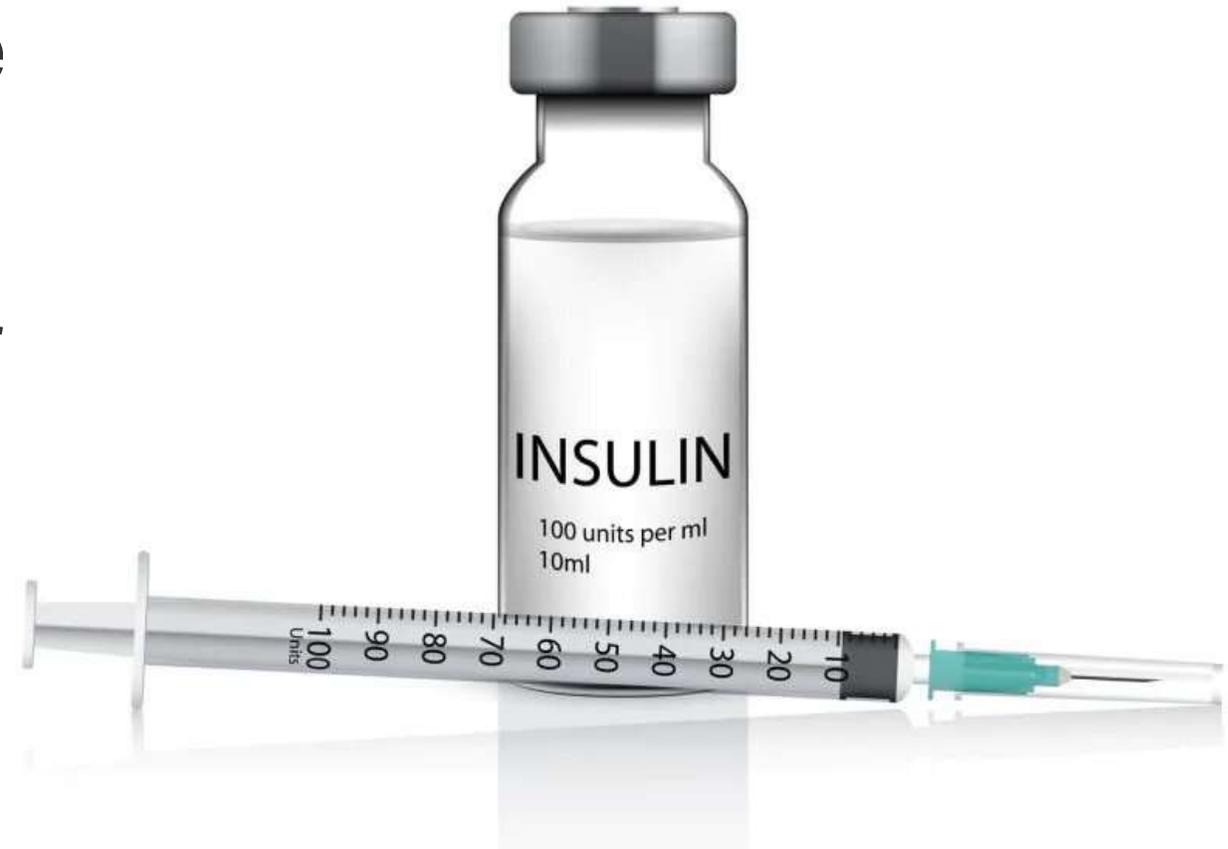
“Vitamin D deficiency is associated with a decreased insulin release, insulin resistance and type 2 diabetes in experimental and epidemiological studies.”



Lips P, Eekhoff M, van Schoor N, Oosterwerff M, de Jongh R, Krul-Poel Y, Simsek S. Vitamin D and type 2 diabetes. J Steroid Biochem Mol Biol. 2017 Oct;173:280-285. doi: 10.1016/j.jsbmb.2016.11.021. Epub 2016 Dec 5. PMID: 27932304.

Diabetes and Nutrient Deficiency

“This large-scale study is the first to report the association between dietary **thiamine** intake and the prevalence of CVDs, diabetes and mental health issues at the national level in Korea.”



Glucose Kinetics

- Dietary intake is a central determinant of blood glucose levels, and thus, in order to achieve normal glucose levels, it is imperative to make food choices that induce normal postprandial (post-meal) glycemic responses (PPGR; [Gallwitz, 2009](#))
- Our results demonstrate high interpersonal variability in PPGRs to the same food. (Zeevi et al 2015)



“Pharmacology”

...as an adjunct to diet and exercise.

- Pharmaceutical effectiveness is predicated upon the presence of adequate metabolic chemistries.
- Considering dietary and lifestyle inputs is critical in optimizing therapeutic outcomes.

**Pharmacists can do foundational nutrition,
nutritionists cannot do pharmacy**

Supply

Parental contribution
Whole food consumption
Microbiome production
Supplementation
(Adequate digestion)

NUTRIENT vs

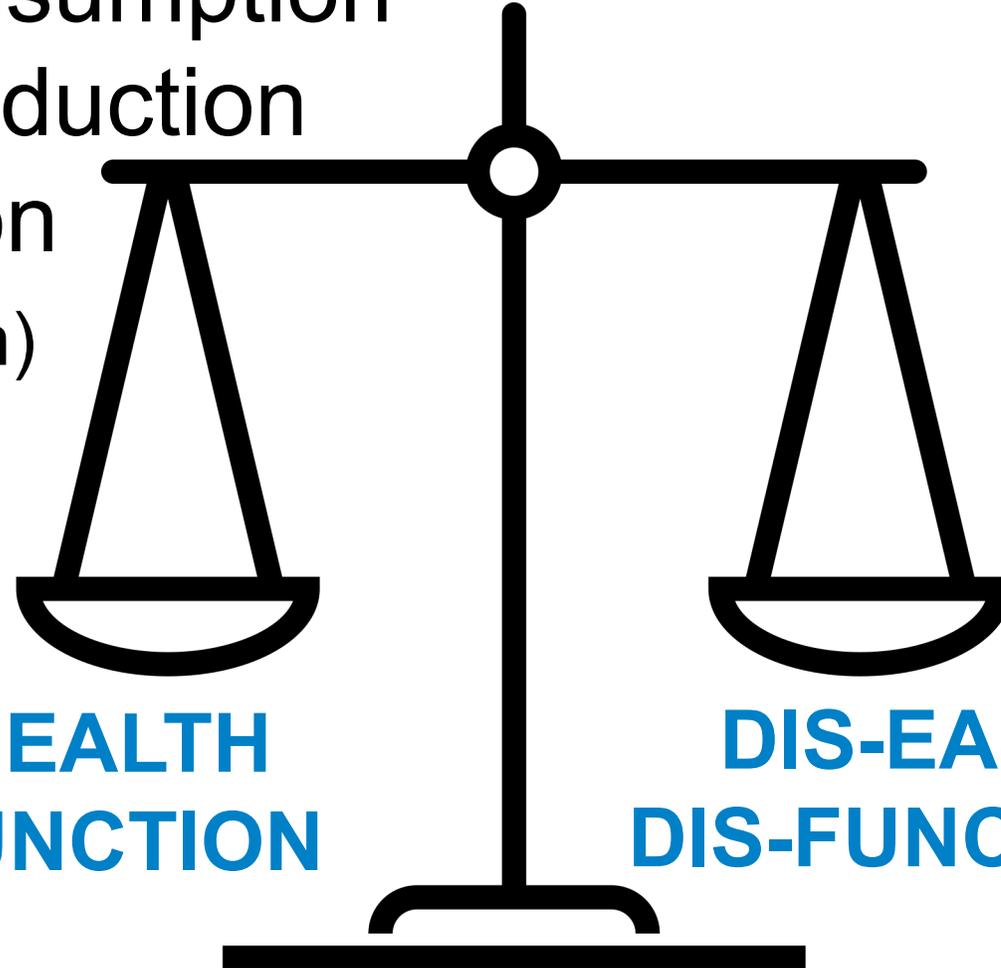
Demands

Energy production
Stress-physiologic,
psychologic
Toxin processing-
Rx, environmental,
fructose, insulin

LIFE!!

**HEALTH
FUNCTION**

**DIS-EASE
DIS-FUNCTION**





**TEN SERVINGS
OF VEGETABLES
AND FRUIT A
DAY**

24 % reduction in risk of heart disease

33 % reduction in risk of stroke

**28 % reduction in risk of
cardiovascular disease**

13 % reduction in risk of total cancer

31 % reduction in dying prematurely

“Plant-Focused” Eating Strategy

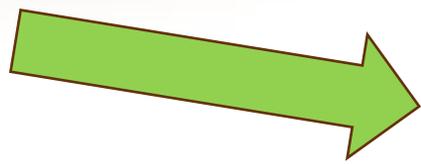


Plant-based eating patterns focus on foods primarily from plants. This includes not only fruits and vegetables, but also nuts, seeds, oils, whole grains, legumes, and beans.

It does NOT mean that you are vegetarian or vegan and never eat meat or dairy.

Rather, you are proportionately choosing more of your foods from plant sources.

“Plant-based” is a confusing, inflammatory term



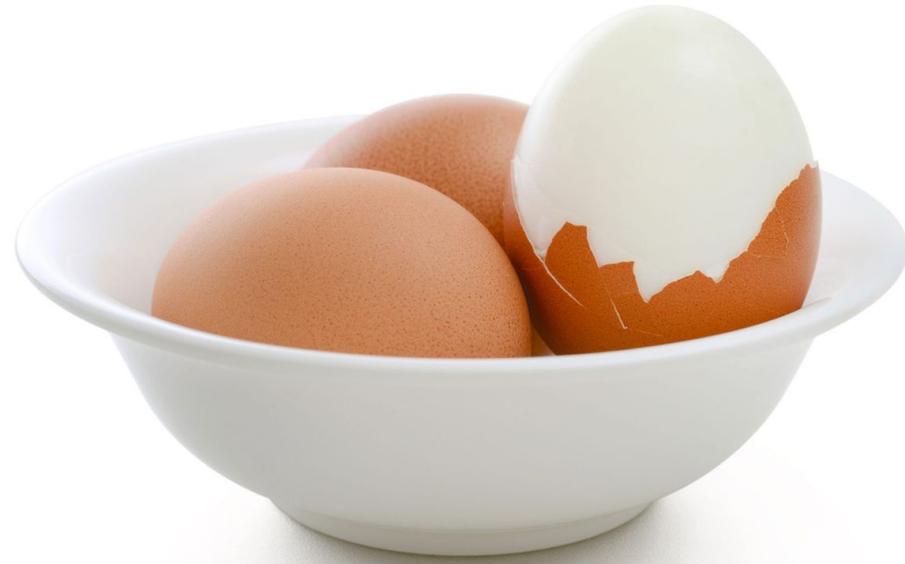
Nutrition Facts	
Valeur nutritive	
Per 2 large eggs (105 g) pour 2 gros oeufs (105 g)	
Calories 160 kcal	% Daily Value* % valeur quotidienne*
Total Fat / Lipides 11 g	15 %
Saturated / saturés 3.5 g	18 %
+ Trans / trans 0 g	
Polyunsaturated / polyinsaturés 2 g	
Omega-6 / omega-6 1.5 g	
Omega-3 / omega-3 0.2 g	
Monounsaturated / monoinsaturés 5 g	
Total Carbohydrate / Glucides 1 g	
Dietary Fibre / Fibres alimentaires 0 g	0 %
Sugars / Sucres 0 g	0 %
Protein / Protéines 13 g	
Cholesterol / Cholestérol 400 mg	
Sodium 130 mg	6 %
Potassium 125 mg	3 %
Calcium 50 mg	4 %
Iron / Fer 1.75 mg	10 %
Vitamin A / Vitamine A 200 ug	22 %
Vitamin C / Vitamine C 0 mg	0 %
Vitamin D / Vitamine D 1.5 ug	8 %
Vitamin E / Vitamine E 4 mg	27 %
Thiamine 0.1 mg	8 %
Riboflavin / Riboflavine 0.5 mg	38 %
Niacin / Niacine 0.1 mg	1 %
Folate 70 ug	18 %
Vitamin B ₃ / Vitamine B ₃ 0.075 mg	4 %
Vitamin B ₆ / Vitamine B ₆ 1.55 ug	65 %
Biotin / Biotine 40 ug	133 %
Pantothenate / Panthothénate 2.2 mg	44 %
Choline 410 mg	75 %
Phosphorous / Phosphore 150 mg	12 %
Iodide / Iodure 45 ug	30 %
Magnesium / Magnésium 10 mg	2 %
Zinc 1.25 mg	11 %
Selenium / Sélénium 31 ug	56 %
Copper / Cuivre 0.08 mg	9 %
Manganese / Manganèse 0.02 mg	1 %

* 5% or less is a little, 15% or more is a lot
* 5% ou moins c'est peu, 15% ou plus c'est beaucoup

“Protein-Focused”

Must source, eat, *digest* and *absorb* protein to maintain function (Avoid sarcopenia, osteoporosis, metabolic dysfunction, etc).

0.36-1gm/lb. of body weight/day



Food as a DOSAGE FORM

‘ACTIVE INGREDIENTS’

- Protein
- Non-Starchy Vegetables
- Legumes
- Nuts and Seeds
- Dairy/Alternatives
- Fats
- Starchy Vegetables
- Fruits
- Whole Grains
- Herb, Spices, Salts

‘COMPOUNDS’

- Stir Fries
- Salads
- Smoothies
- Soups



R_x recipere-“Take thou”

Creamy Eggs and Green Beans



- ‘Compounding’ equipment- Electric Skillet, mixing bowl, fork/whisk, spatula, can opener, knife, dispensing ‘device’
- ACTIVE INGREDIENTS- Eggs, flavored oil, salt/spices, green beans
- Patient Education



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The *voice* of the
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