

Casual Friday Series

# **Endocrine Expertise: When Energy Won't Balance**

A Biogenetix Clinical Presentation

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# Disclaimer

- *Information in this presentation is not intended, in itself, to diagnose, treat, reverse, cure, or prevent any disease. While this presentation is based on medical literature, findings, and text, The following statements have not been evaluated by the FDA.*
- *The information provided in this presentation is for your consideration only as a practicing health care provider. Ultimately you are responsible for exercising professional judgment in the care of your own patients.*

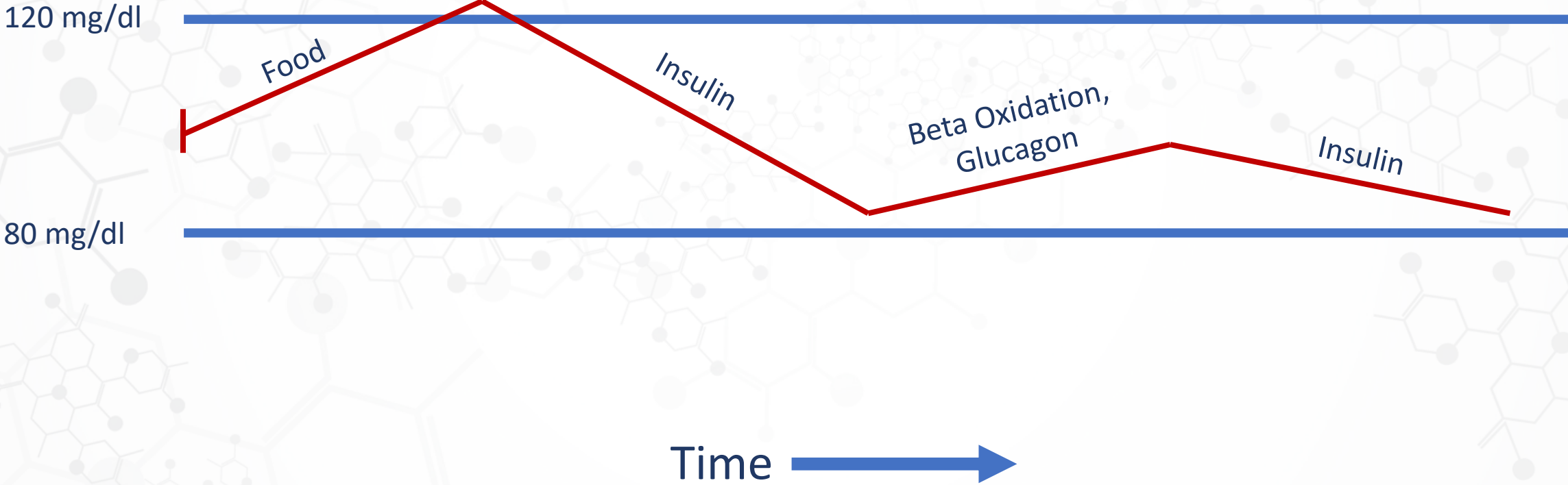


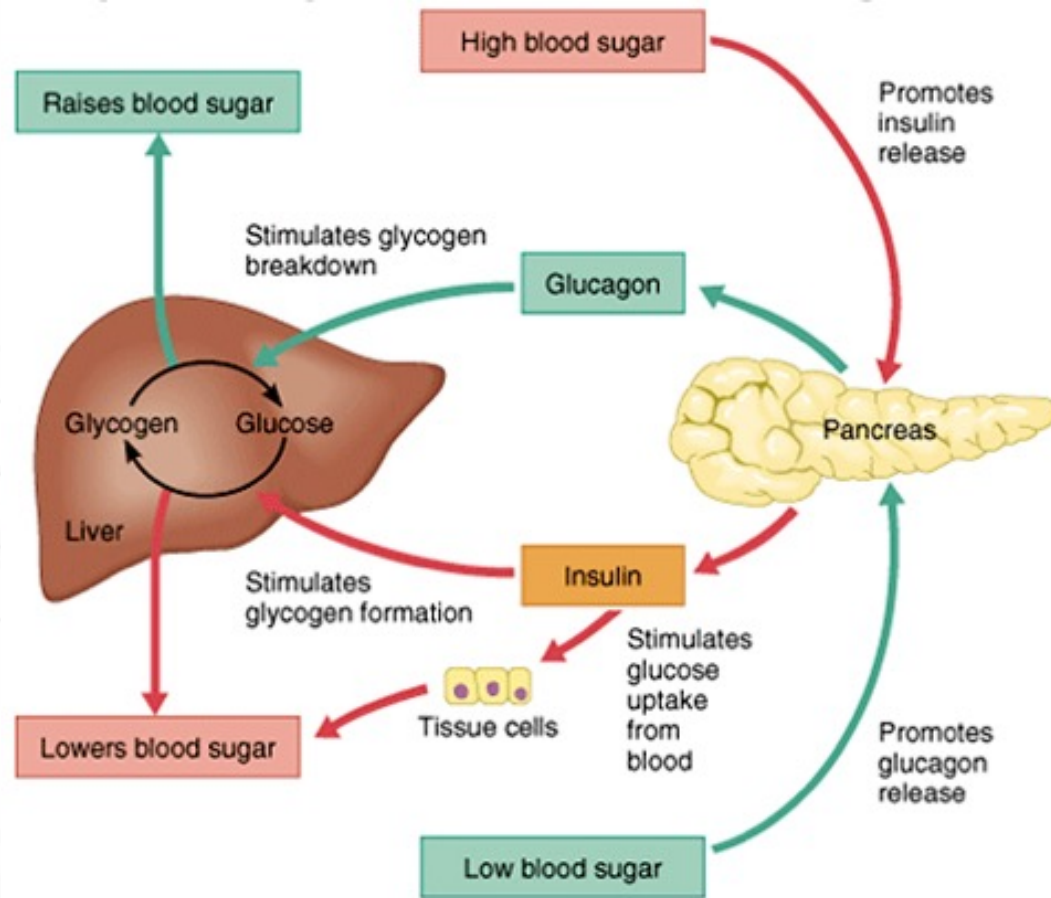


Lifestyle + Genetics = Chronic Health IMPROVEMENT

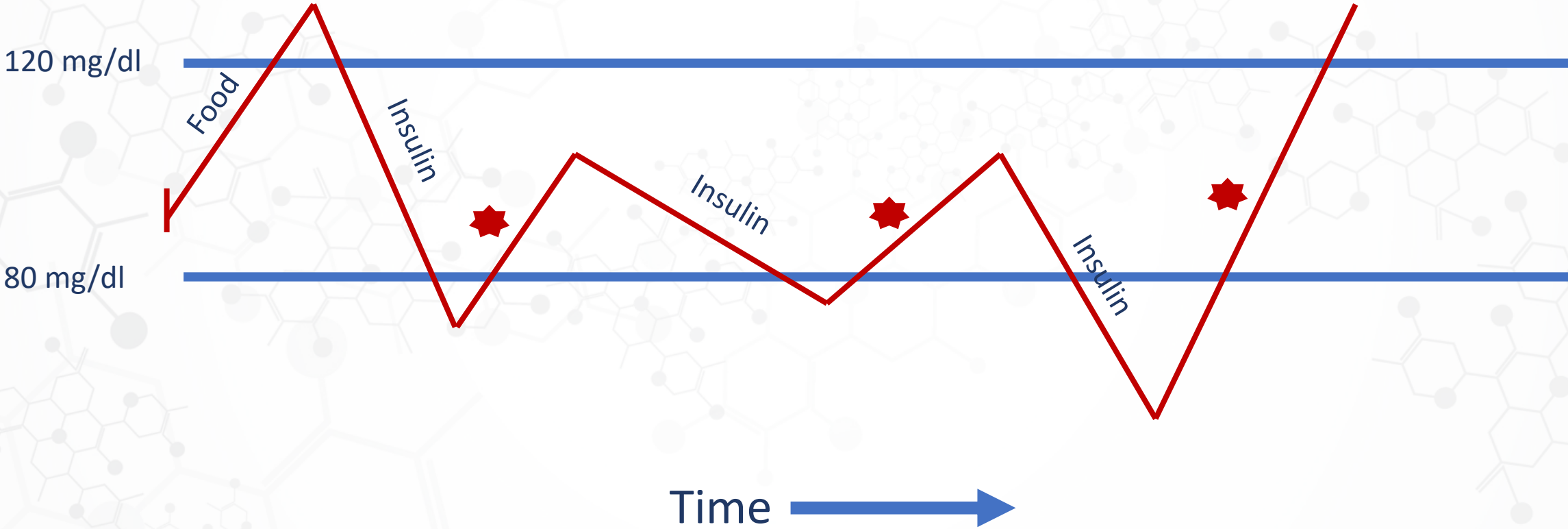


# Post Prandial Stability



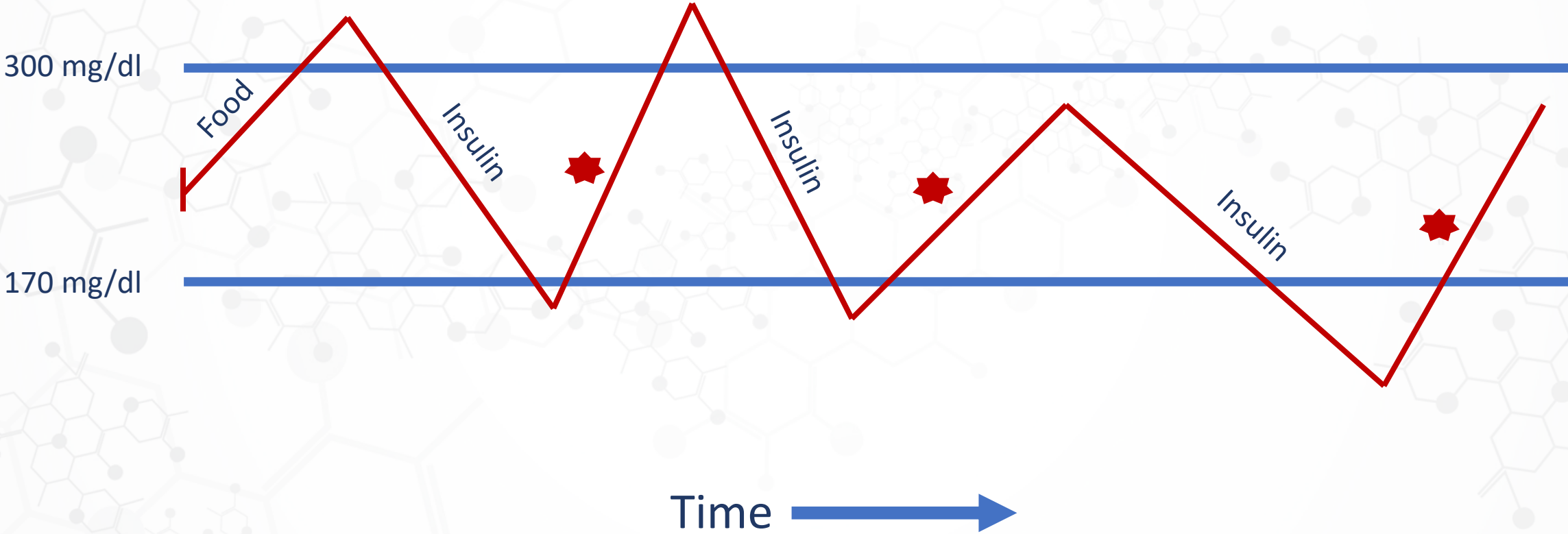


# Post Prandial Instability Non-DM



★ Glucagon, Epinephrine, Insulin

# Post Prandial Instability DM



★ Glucagon, Epinephrine, Insulin



120 mg/dl

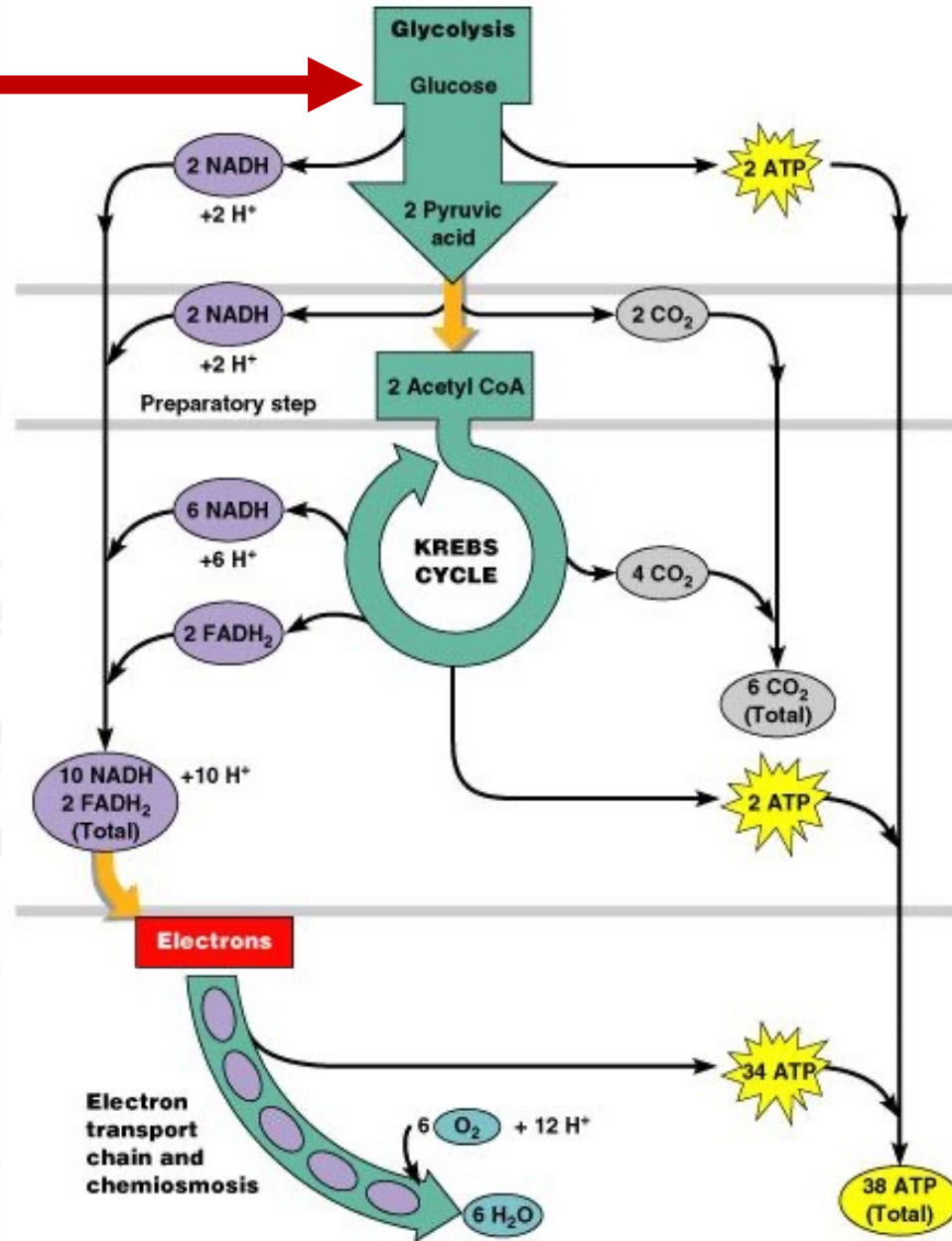
80 mg/dl

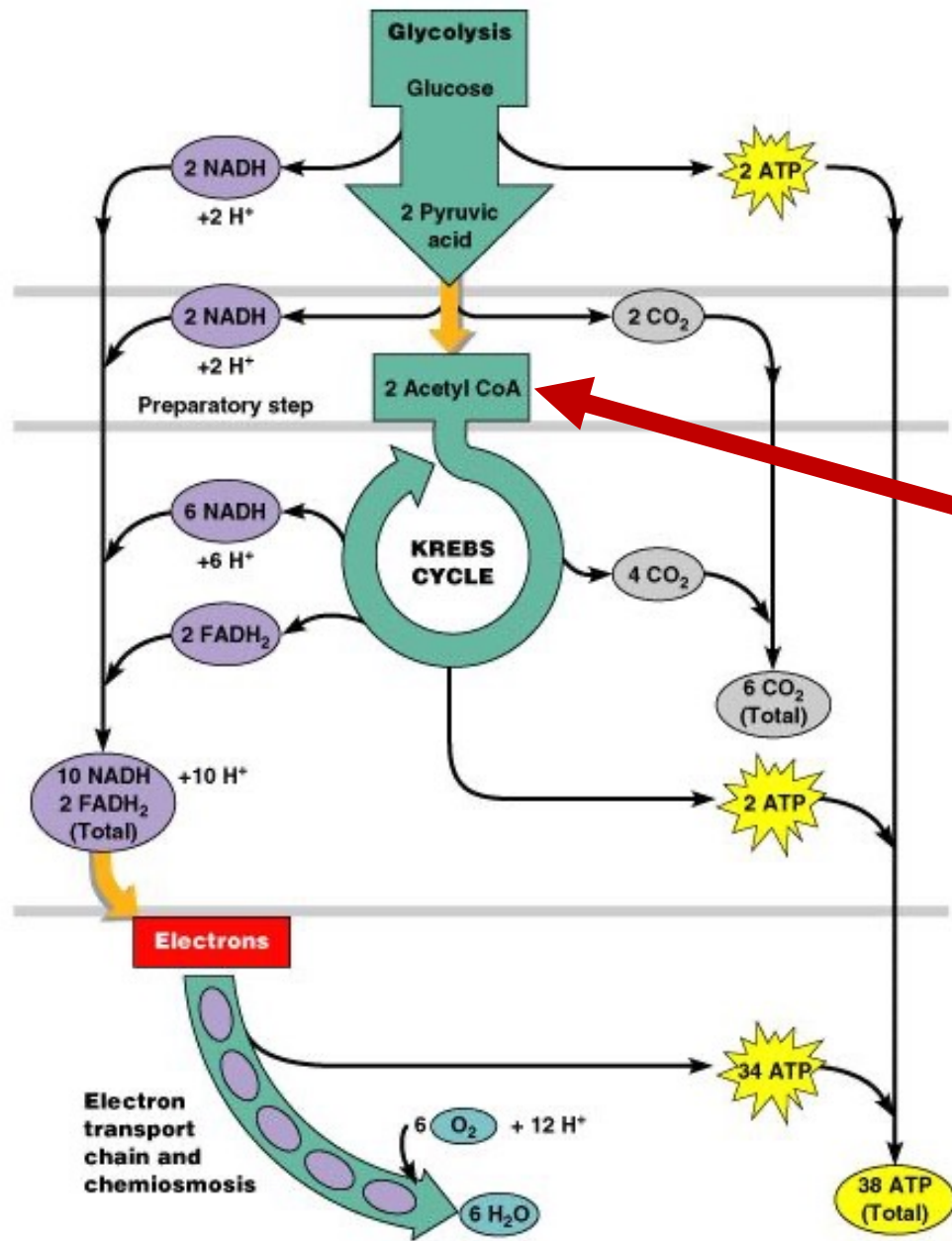
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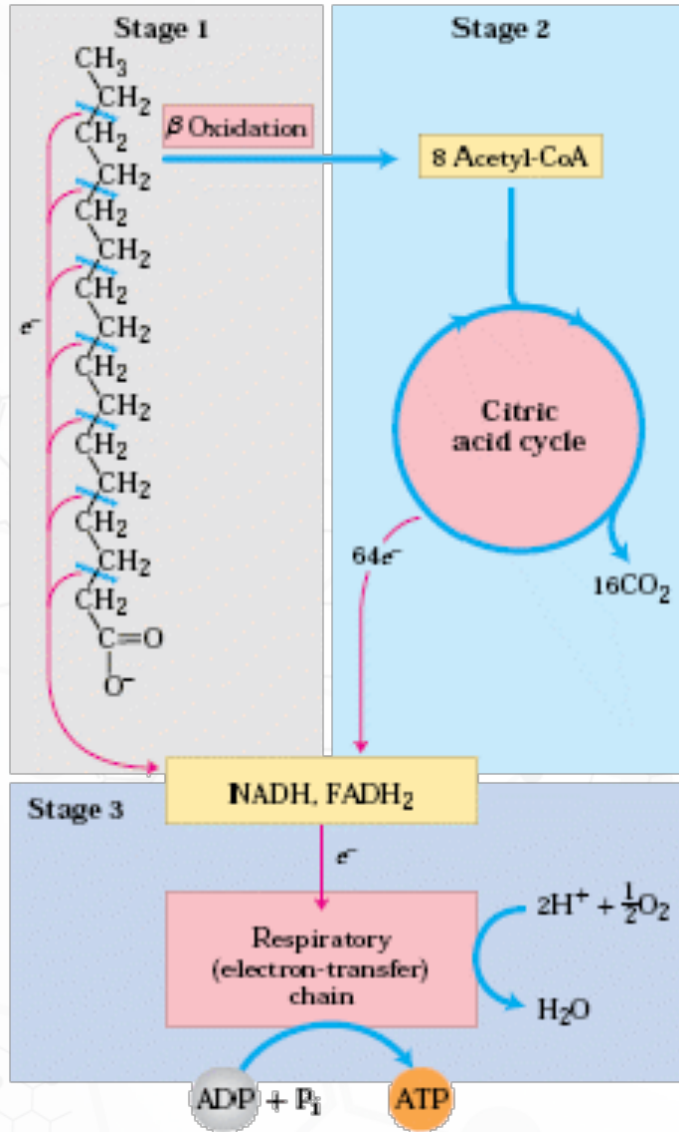
# All about GLUCOSE





B-Oxidation  
-ON RAMP-





Beta Oxidation of a 16-Carbon Fatty Acid (palmitic acid) yields:

# 8 Acetyl-CoA

(Glycolysis of Glucose yields 2 Acetyl-CoA)

Lipases

Triglycerides  
to FFA



Carnitine  
transporter

Blood stream  
into cell



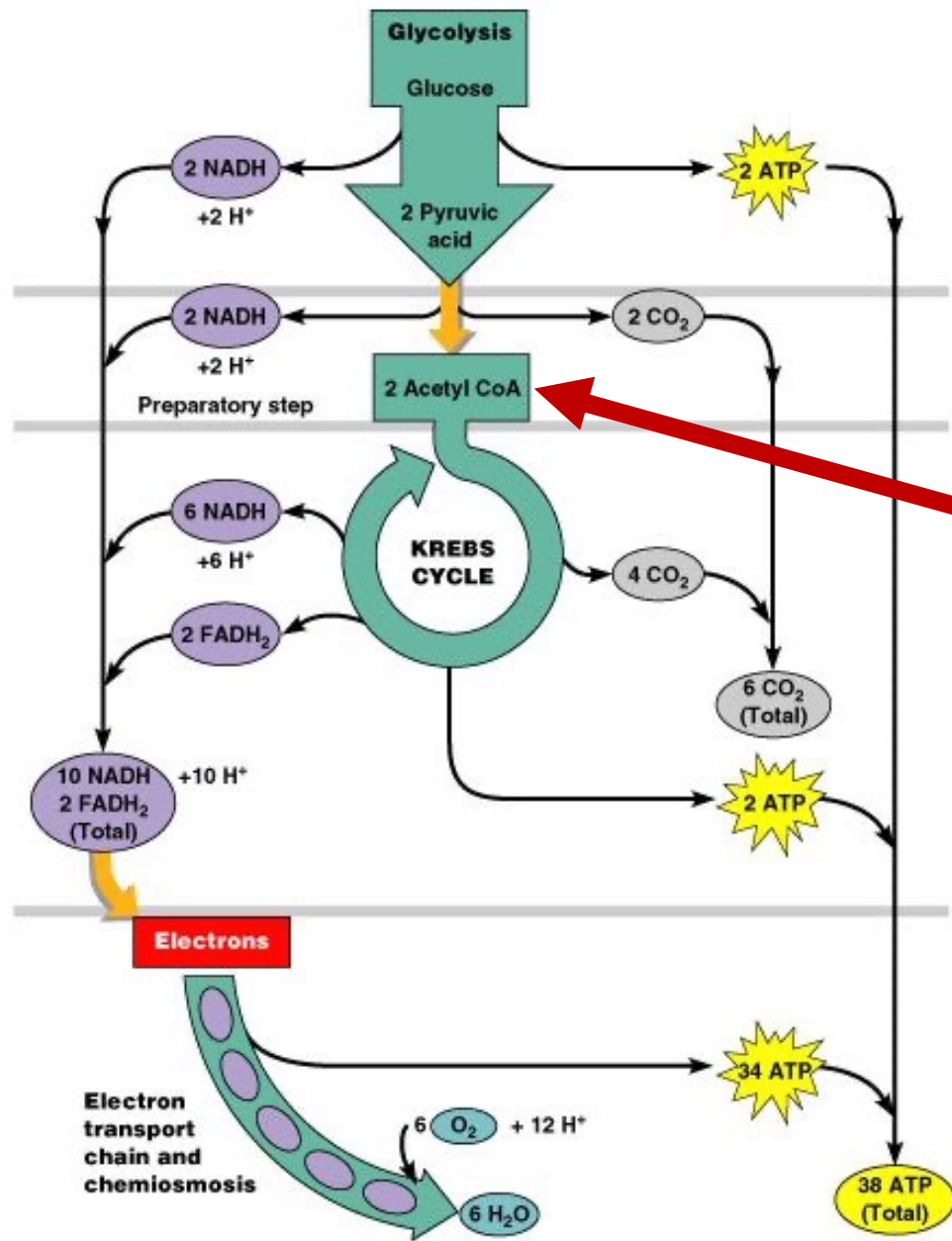
Carnitine  
shuttle

Cytosol to  
mitochondria



Beta oxidation to  
energy tokens





B-Oxidation  
ON RAMP for 8  
Acetyl-CoA/16C FA





# ATP Yields

Substrate	ATP yield (mol ATP/ mol substrate)	Oxygen consumed (mol atomic O/ mol substrate)	ATP/oxygen (mol ATP/ mol O)
Glucose	36	12	3.0
Lactate	18	6	3.0
Pyruvate	15	6	2.5
Palmitate	129	50	2.6

Assumes complete coupling of ATP synthesis to oxygen consumptions in the mitochondria in vivo. It has recently been noted that the actual ATP/oxygen ratio may be significantly lower in the intact heart (Brand et al, *Biochemistry* 1994;16:20–24).

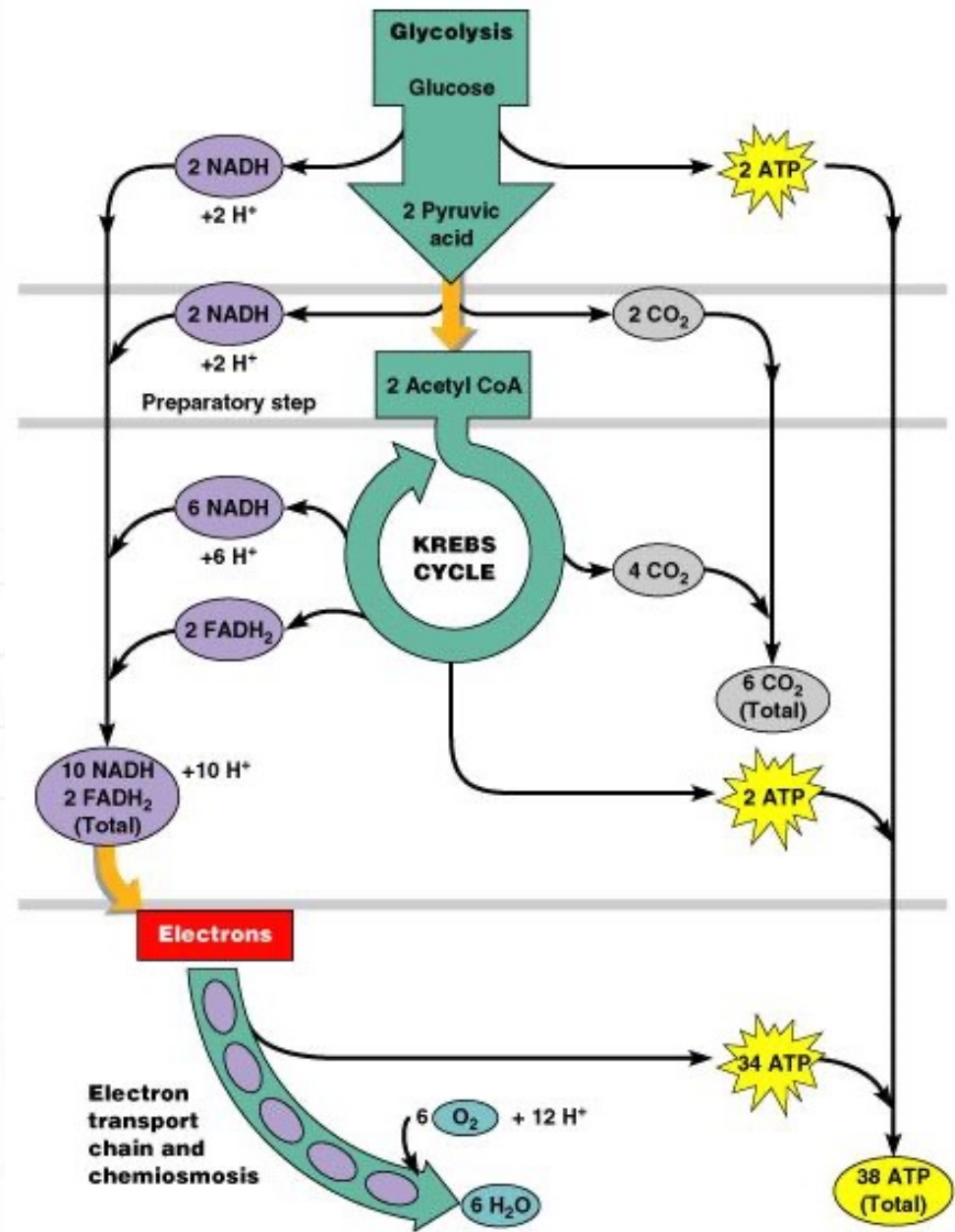


# Energy Balance Problems...

- Carnitine deficiency or genetic inability to absorb/create.
- What's in the fat? Downgrading to phospholipids...
- Insulin resistant?
- ROS overload
- Low body weight?
- Veganism, vegetarianism...downgrading to phospholipids...







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PMID: [26828774](#)

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## CARNITINE TRANSPORT AND FATTY ACID OXIDATION

[Nicola Longo](#),<sup>1,2</sup> [Marta Frigeni](#),<sup>1</sup> and [Marzia Pasquali](#)<sup>2</sup>

Carnitine is essential for the transfer of long-chain fatty acids across the inner mitochondrial membrane for subsequent  $\beta$ -oxidation. It can be synthesized by the body or assumed with the diet from meat and dairy products. Defects in carnitine biosynthesis do not routinely result in low plasma carnitine levels. Carnitine is accumulated by the cells and retained by kidneys using OCTN2, a high affinity organic cation transporter specific for carnitine. Defects in the OCTN2 carnitine transporter results in autosomal recessive primary carnitine deficiency characterized by decreased intracellular carnitine accumulation, increased losses of carnitine in the urine, and low serum carnitine levels. Patients can present early in life with hypoketotic hypoglycemia and hepatic encephalopathy, or later in life with skeletal and cardiac myopathy or sudden death from cardiac arrhythmia, usually triggered by fasting or catabolic state. This disease responds to oral carnitine that, in pharmacological doses, enters cells using the amino acid transporter B<sup>0,+</sup>. Primary carnitine deficiency can be suspected from the clinical presentation or identified by low levels of free carnitine (C0) in the newborn screening. Some adult patients have been diagnosed following the birth



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PMCID: PMC6101675

NIHMSID: NIHMS966074

PMID: [28915320](https://pubmed.ncbi.nlm.nih.gov/28915320/)

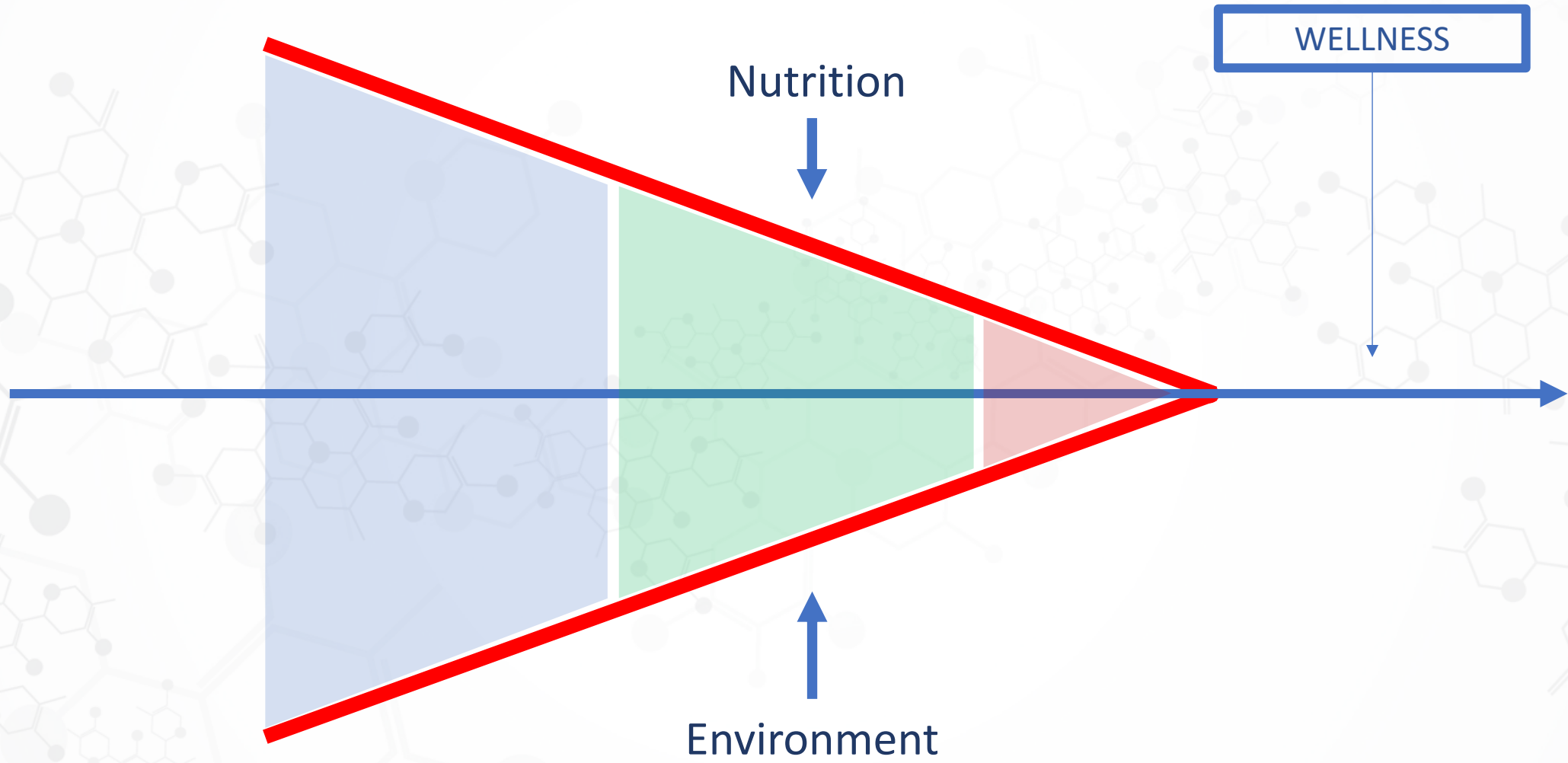
## Adipose Tissue as a Site of Toxin Accumulation

[Erin Jackson](#), [Robin Shoemaker](#), [Nika Larian](#), and [Lisa Cassis](#)

It is clear that POPs have physical characteristics that enable their bioaccumulation in adipose tissue, resulting in greater body burdens of a wide array of environmental toxicants with distinct mechanisms of action in the setting of expanded AT mass. It is also clear that accumulating evidence supports a role for various POPs in the development of obesity, and in obesity-associated conditions such as type 2 diabetes. Association of POPs with obesity and/or diabetes have indicated that low level exposures, as would be experienced by the majority of US citizens, may influence not only the development of diabetes in adults,



# Protocols



WELLNESS

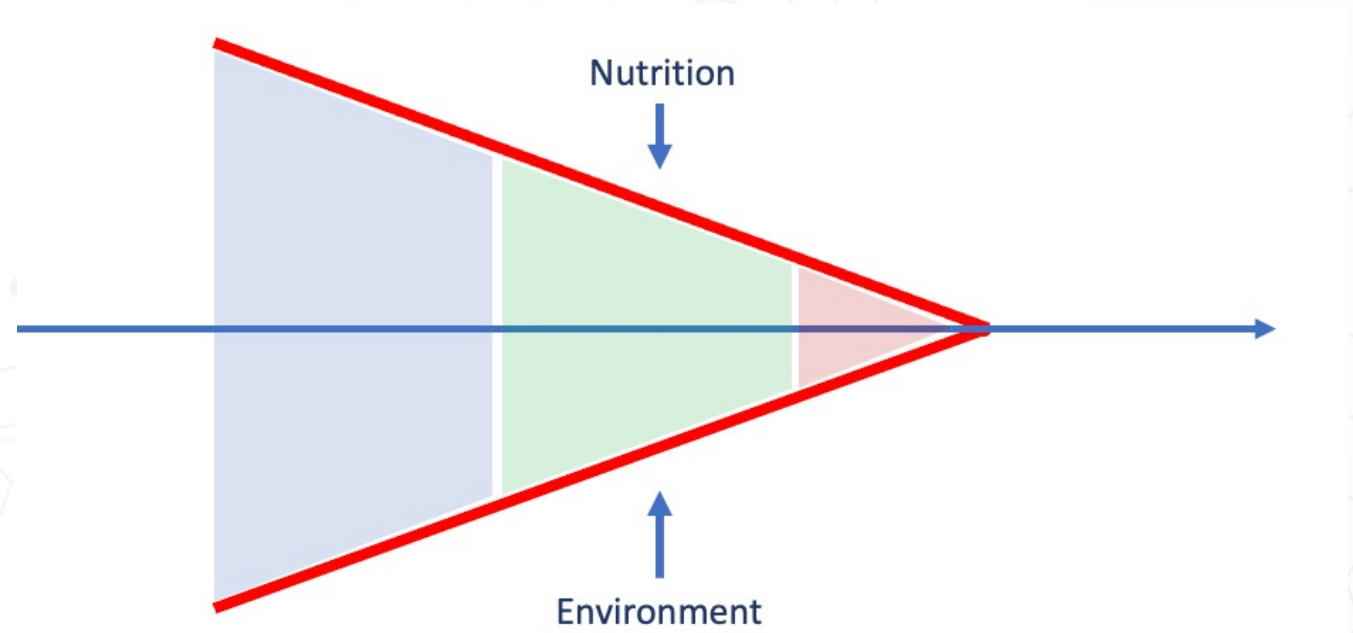
Nutrition

Environment





# Glucogen



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