Casual Friday Series

Endocrine Expertise: Driving Adrenal Dysfunction

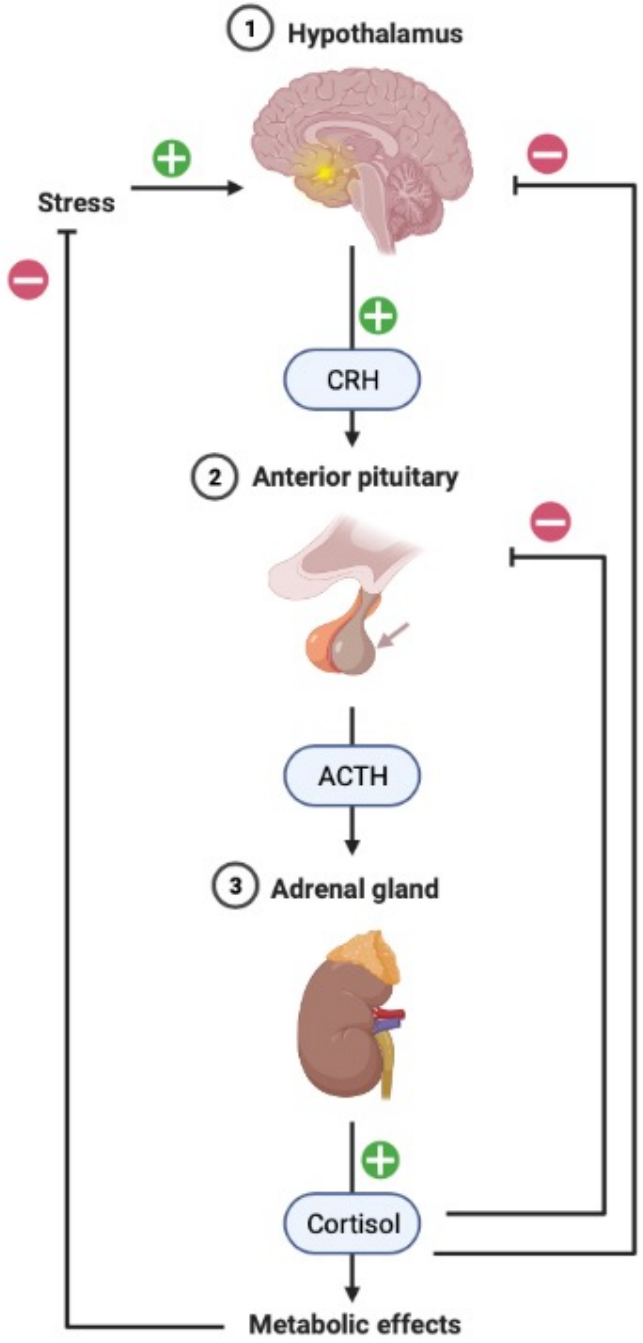
A Biogenetix Clinical Presentation

BIOGENETIX.COM

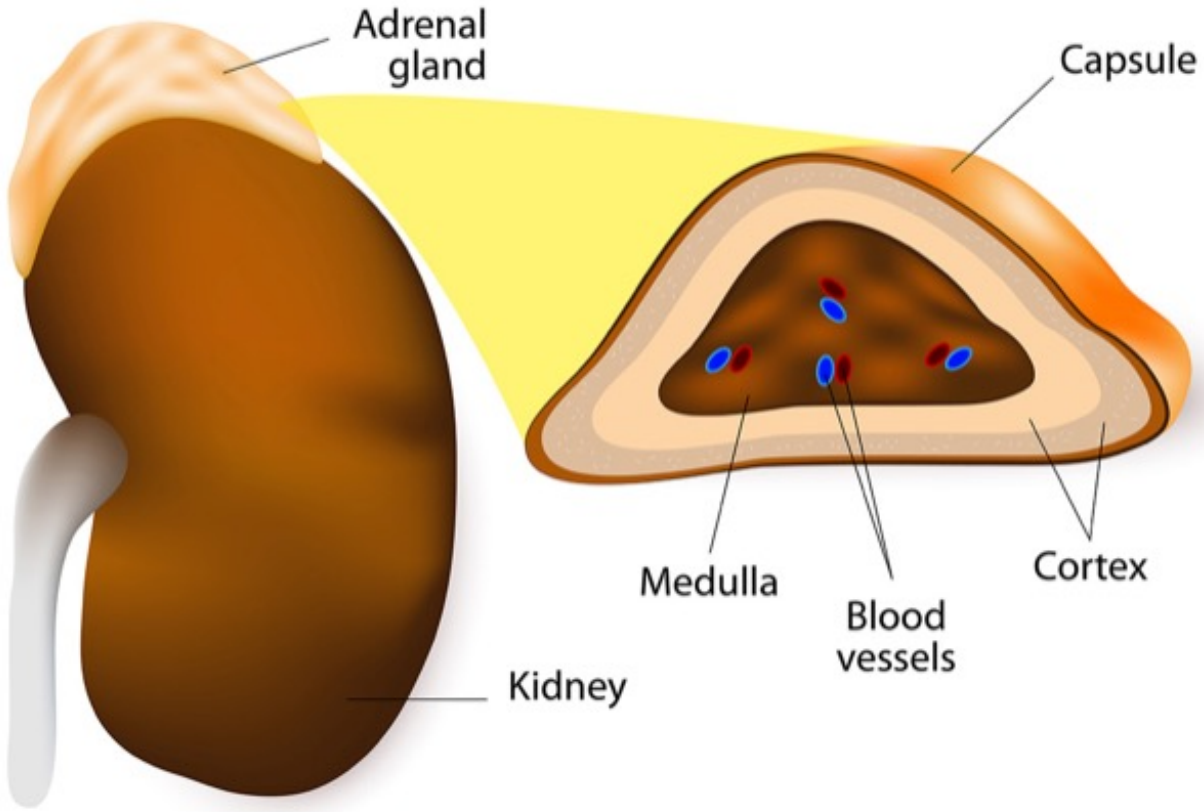
Disclaimer

- *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



ADRENAL GLAND



https://www.hopkinsmedicine.org/health/conditions-and-diseases/adrenal-glands

Adrenal Notes

<u>Hormones Produced</u>:

Cortisol

Aldosterone

DHEA and Androgenic Steroids

Epinephrine

Norepinephrine

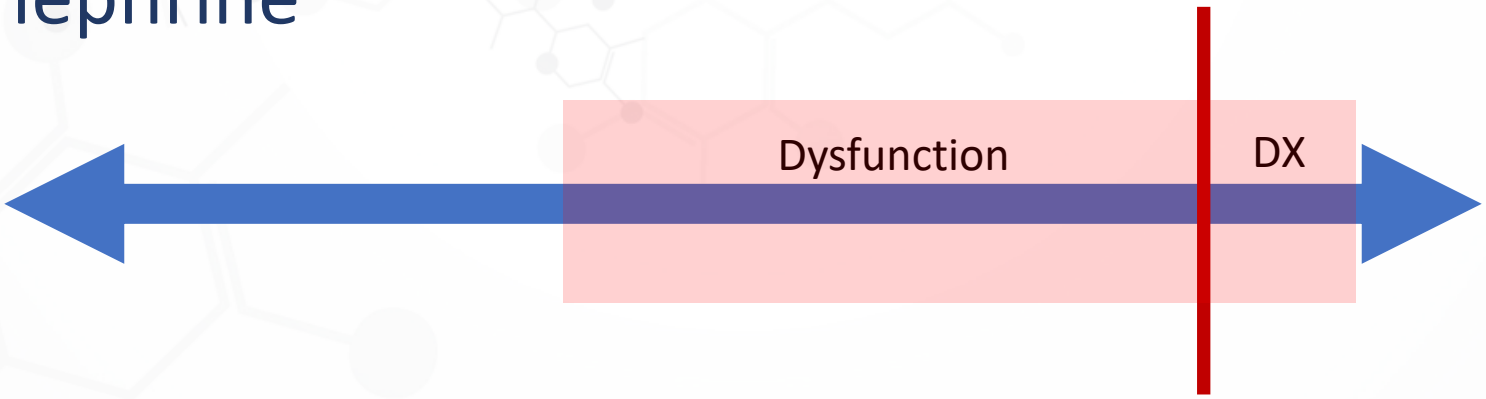
<u>Pathologies:</u>

Addison's

Cushing's

Hyperaldosteronism

Pheochromocytoma



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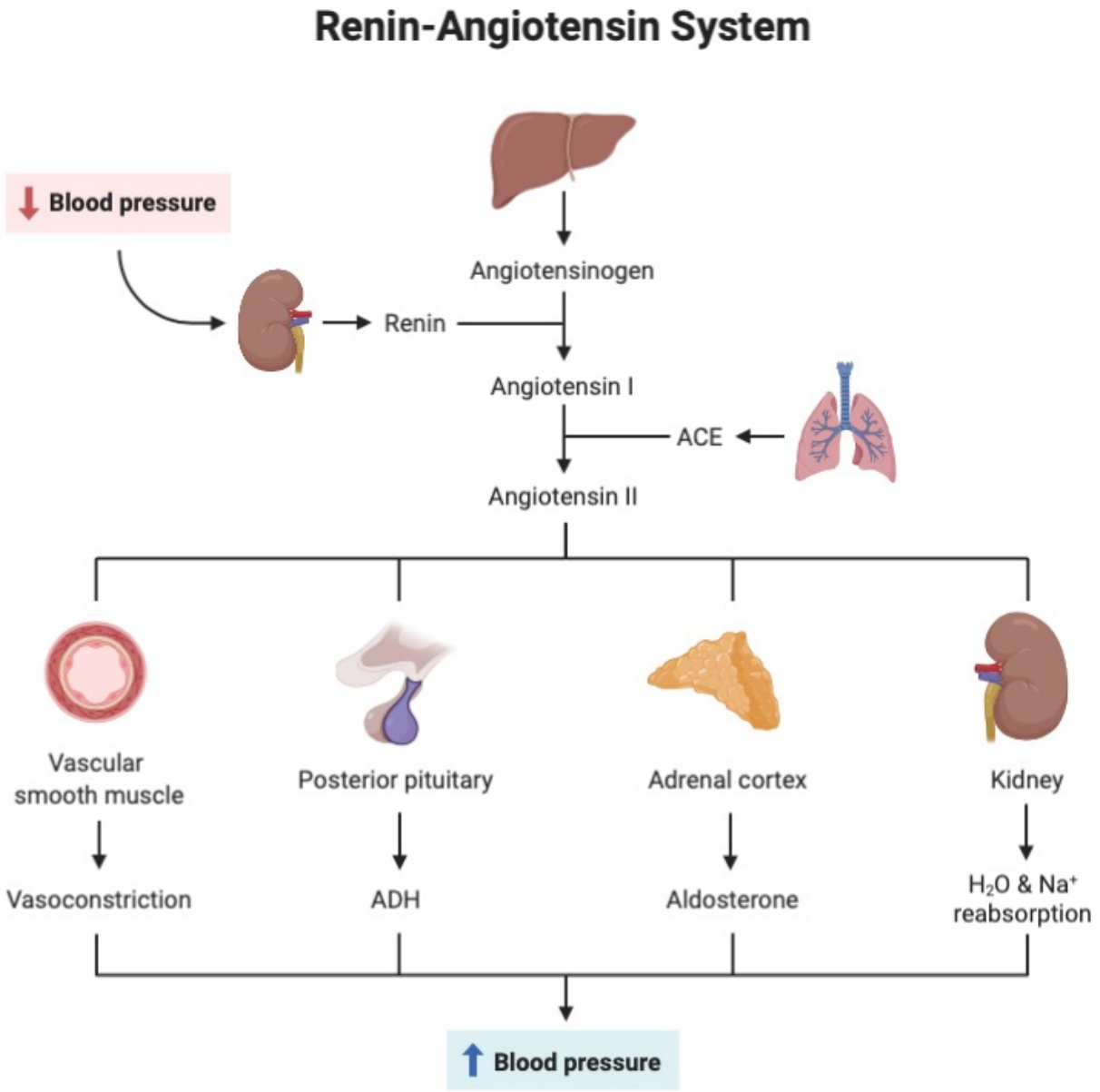

aldosterone noun

Save Word

al·do·ste·rone | \ al-ˈdä-stə-ˌrōn ; ˌal-dō-ˈster-ˌōn, -ˈstir- ; ˈal-dō-stə-ˌrōn \

Definition of *aldosterone*

: a steroid hormone $C_{21}H_{28}O_5$ of the adrenal cortex that functions in the regulation of the salt and water balance of the body

What are the physiologic effects of aldosterone and how does dysfunction contribute to adrenal crisis?

Updated: Sep 01, 2020 | Author: Kevin M Klauer, DO, EJD, FACEP; Chief Editor: Romesh Khardori, MD, PhD, FACP more...

Aldosterone is produced by multiple hydroxylations of deoxycorticosterone and is normally 60% protein bound. The renin-angiotensin system stimulates aldosterone release. Increased potassium stimulates aldosterone production, and decreased potassium inhibits production. Chronic adrenocorticotropic hormone (ACTH) deficiency may inhibit production.

The primary actions of aldosterone cause the kidneys, gut, and salivary/sweat glands to affect electrolyte balance. The primary targets are the kidneys; where it stimulates reabsorption of sodium and secretion of potassium and hydrogen ions. The kidneys' effect on sodium and potassium depend on the intake of these cations (ie, increased sodium intake = increased potassium secretion). The effects on hydrogen probably can occur independently.

Persistent aldosterone excess results in atrial natriuretic factor release and renal hemodynamic changes for compensation. Congestive heart failure (CHF) and cirrhosis with ascites are exceptions that cause progressive sodium retention. Excess aldosterone results in sodium retention, hypokalemia, and alkalosis. Aldosterone deficiency results in sodium loss, hyperkalemia, and acidosis. Hyperkalemia stimulates aldosterone release to improve potassium excretion. Aldosterone is the first-line defense against hyperkalemia.

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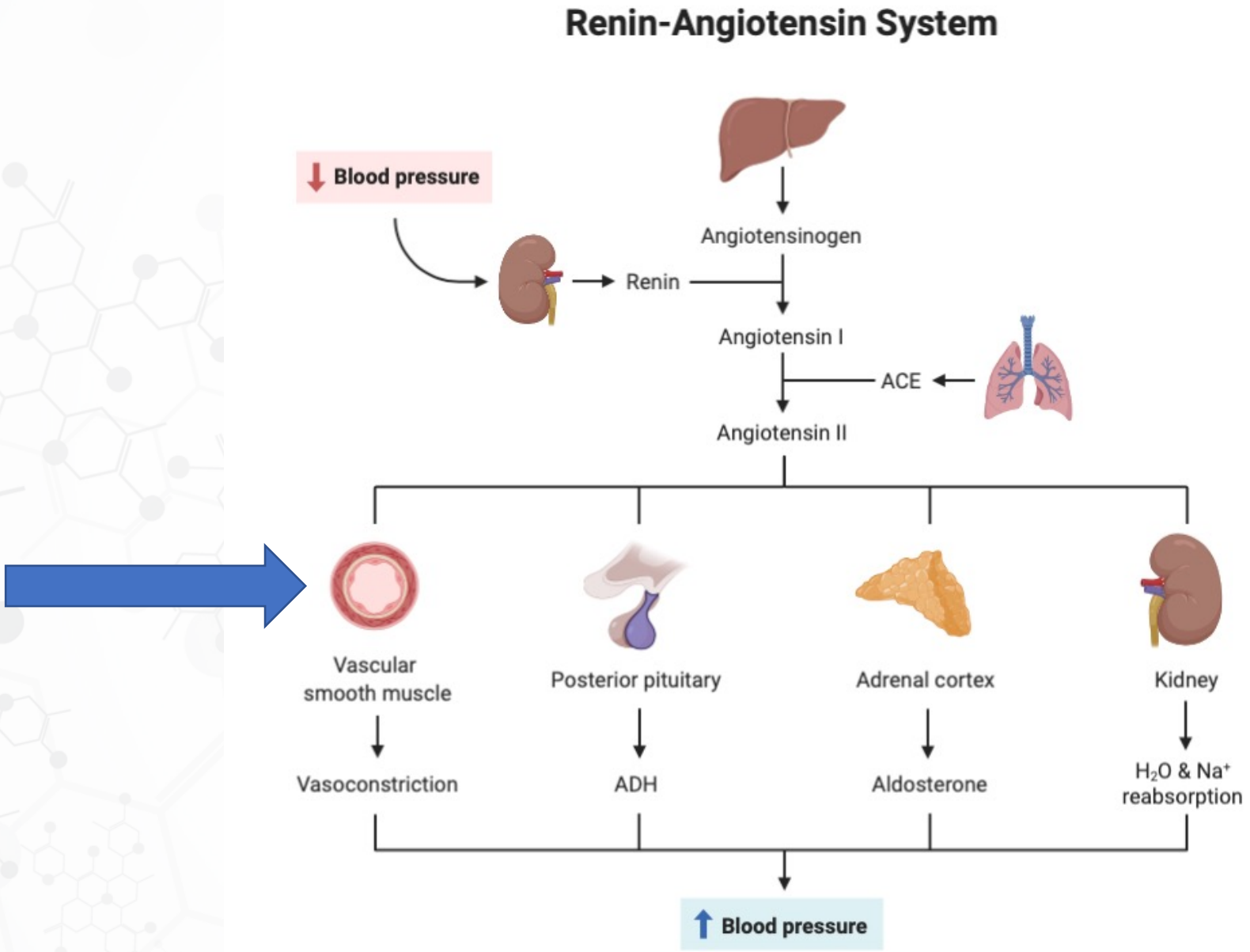

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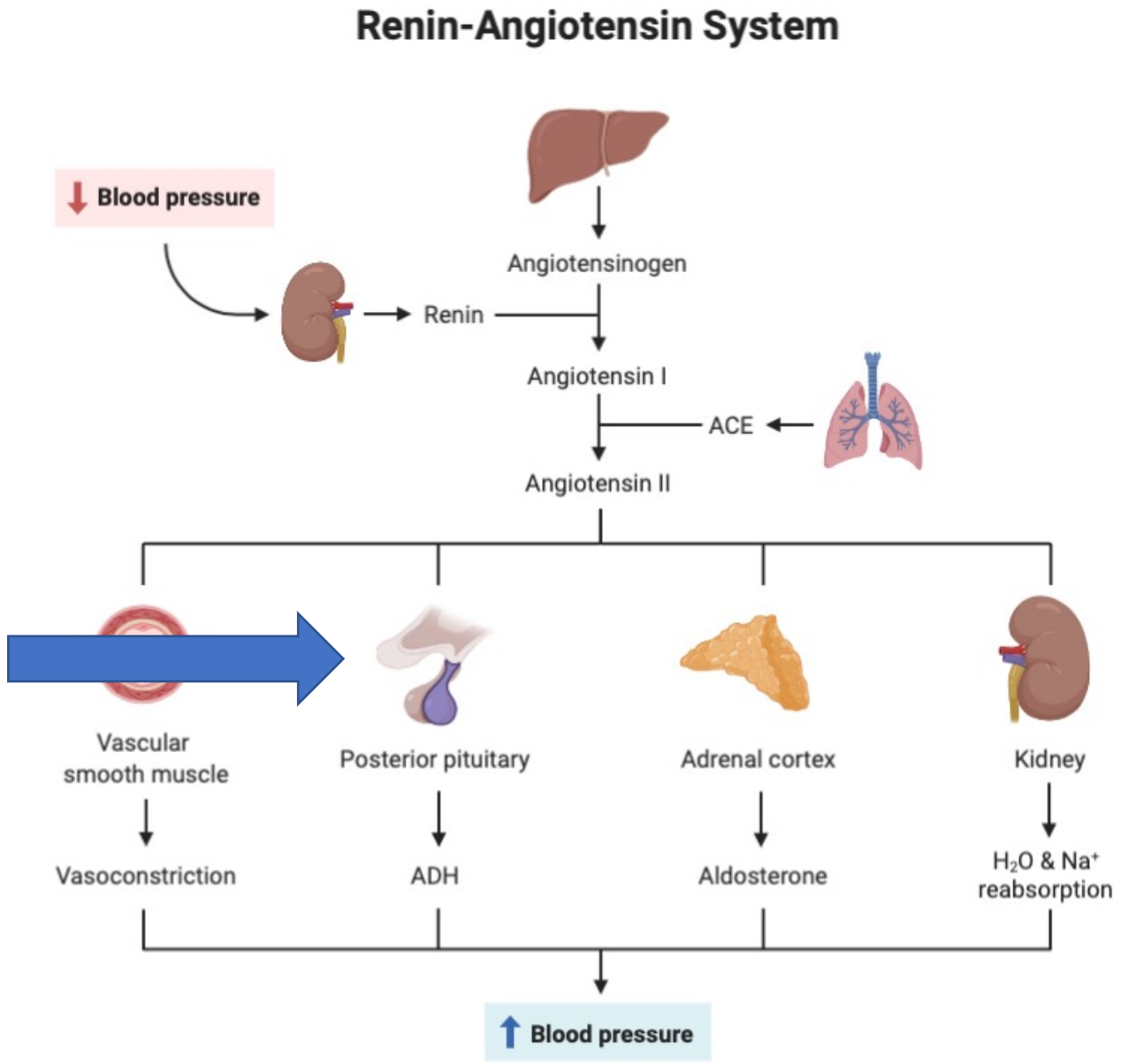

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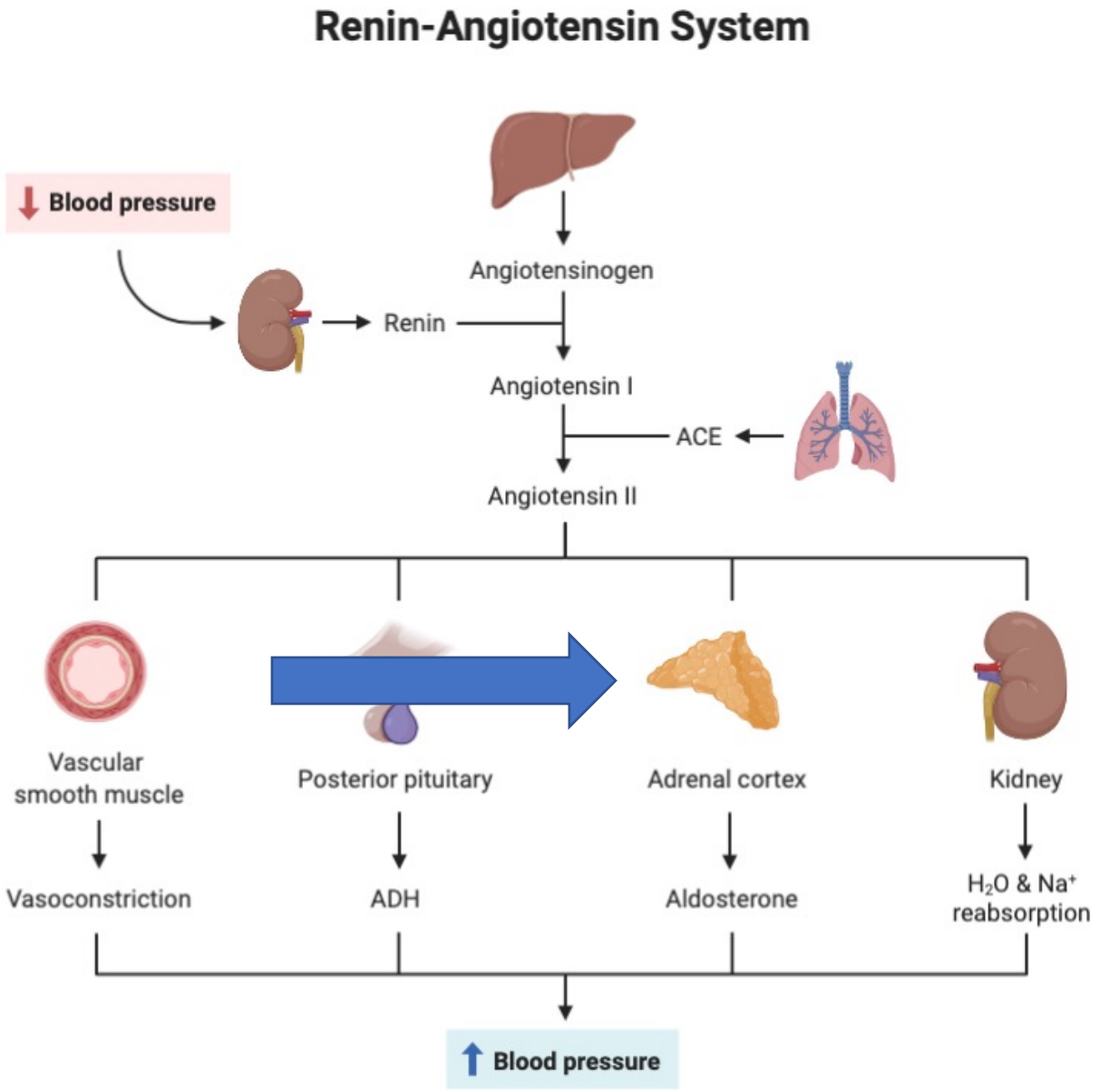

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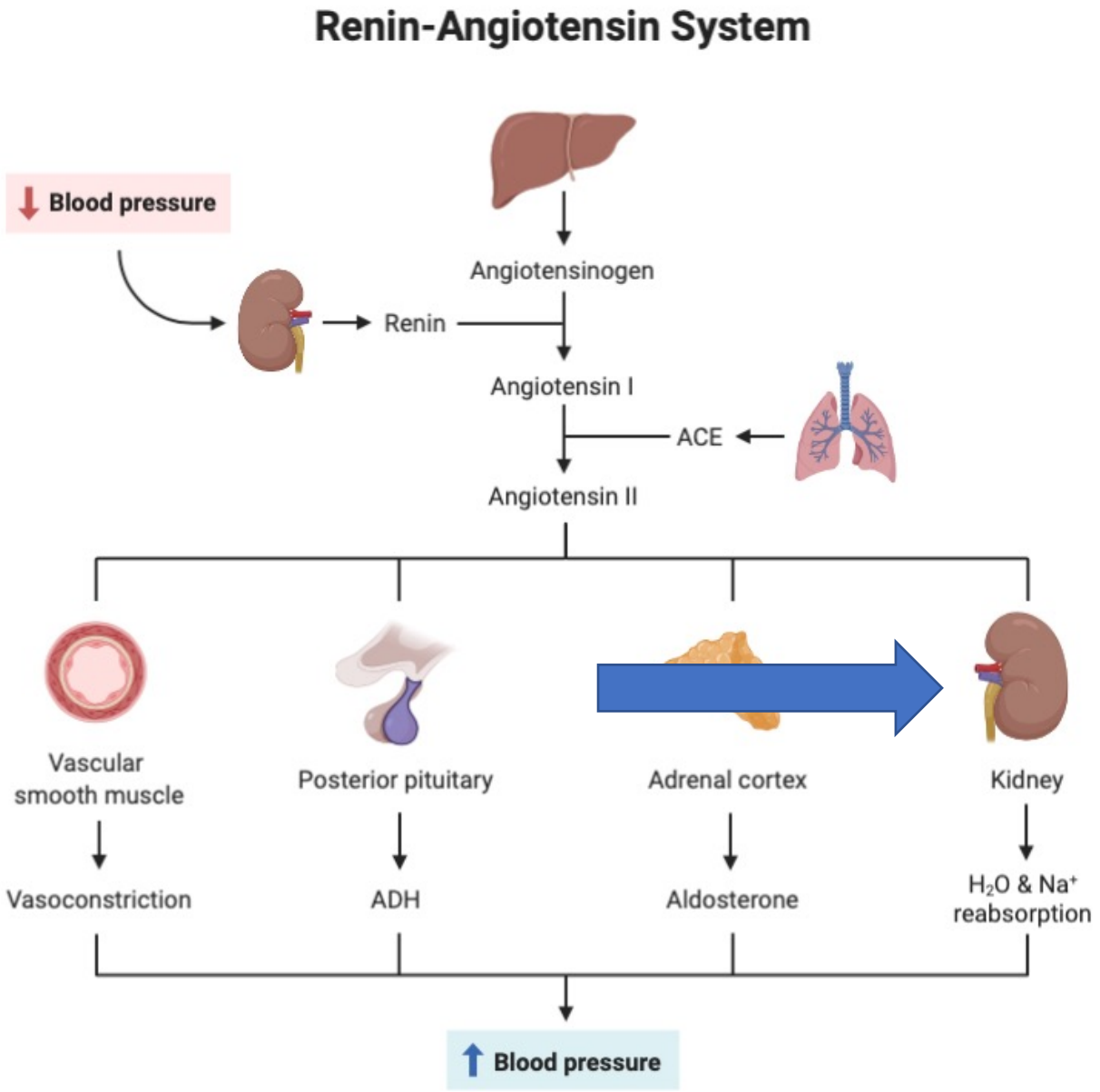
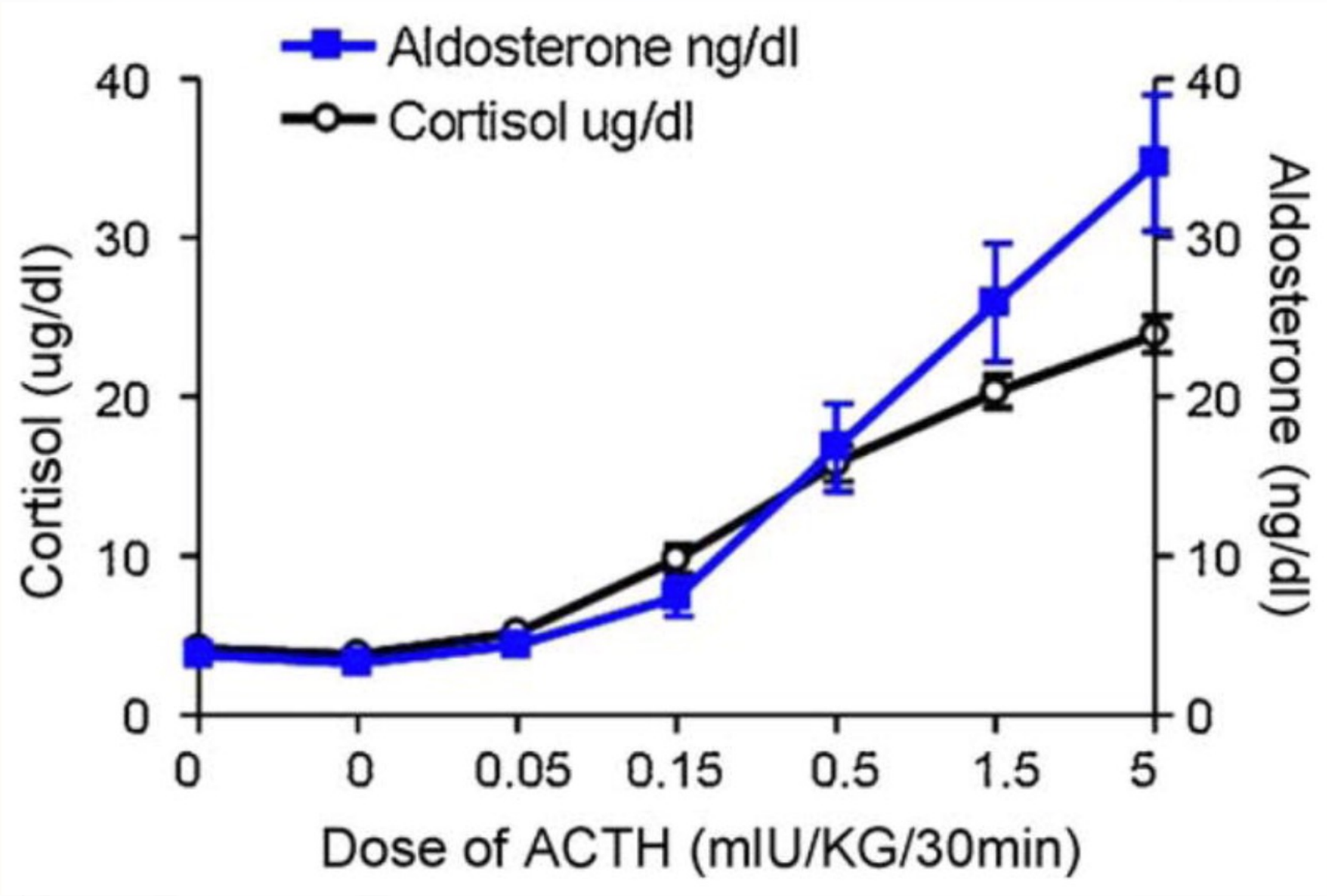


Neurosci Biobehav Rev. Author manuscript; available in PMC 2011 May 23.
Published in final edited form as:
Neurosci Biobehav Rev. 2010 Jan; 34(1): 80–86.
Published online 2009 Jul 22. doi: 10.1016/j.neubiorev.2009.07.005
PMCID: PMC3099453
NIHMSID: NIHMS290087
PMID: 19631234

Aldosterone: A forgotten mediator of the relationship between psychological stress and heart disease

Few studies have directly addressed the mechanisms for the observed associations between psychological stress, HPA axis activation and CVD (Girod and Brotman, 2004). Building on emerging findings that excess activation of MR plays a key pathophysiologic role in the development of CVD, and the potential relationship between stress, negative affective states, and increased production of adrenal glucocorticoid and mineralocorticoid, we propose MR activation by adrenal steroids, in particular aldosterone, as a relevant mediator in the link between psychological stress and CVD. Current evidence for the link between aldosterone, MR activation, and increased risk of CVD is strong (Yoshimoto and Hirata, 2007; Garg and Adler, 2009), and work on the relation between aldosterone and psychological stress is promising. Important next steps will include experimental research to determine the link between high levels of psychological stress, aldosterone, and cardiovascular reactivity, epidemiologic studies considering aldosterone as a mediator of the observed relationship between chronic negative affect and development of CVD, and the relation of chronic negative affect and aldosterone with pre-disease markers of CVD, and the molecular mechanisms linking chronic negative affect to aldosterone. With this work, new insight may be gained into how psychological stress may impair cardiovascular health.


Aldosterone ng/dl
Cortisol ug/dl
Cortisol (ug/dl)
Aldosterone (ng/dl)
0
10
20
30
40
0
0
0.05
0.15
0.5
1.5
5
Dose of ACTH (mIU/KG/30min)

Adrenal Insufficiency

Martin R. Huecker; Beenish S. Bhutta; Elvita Dominique.

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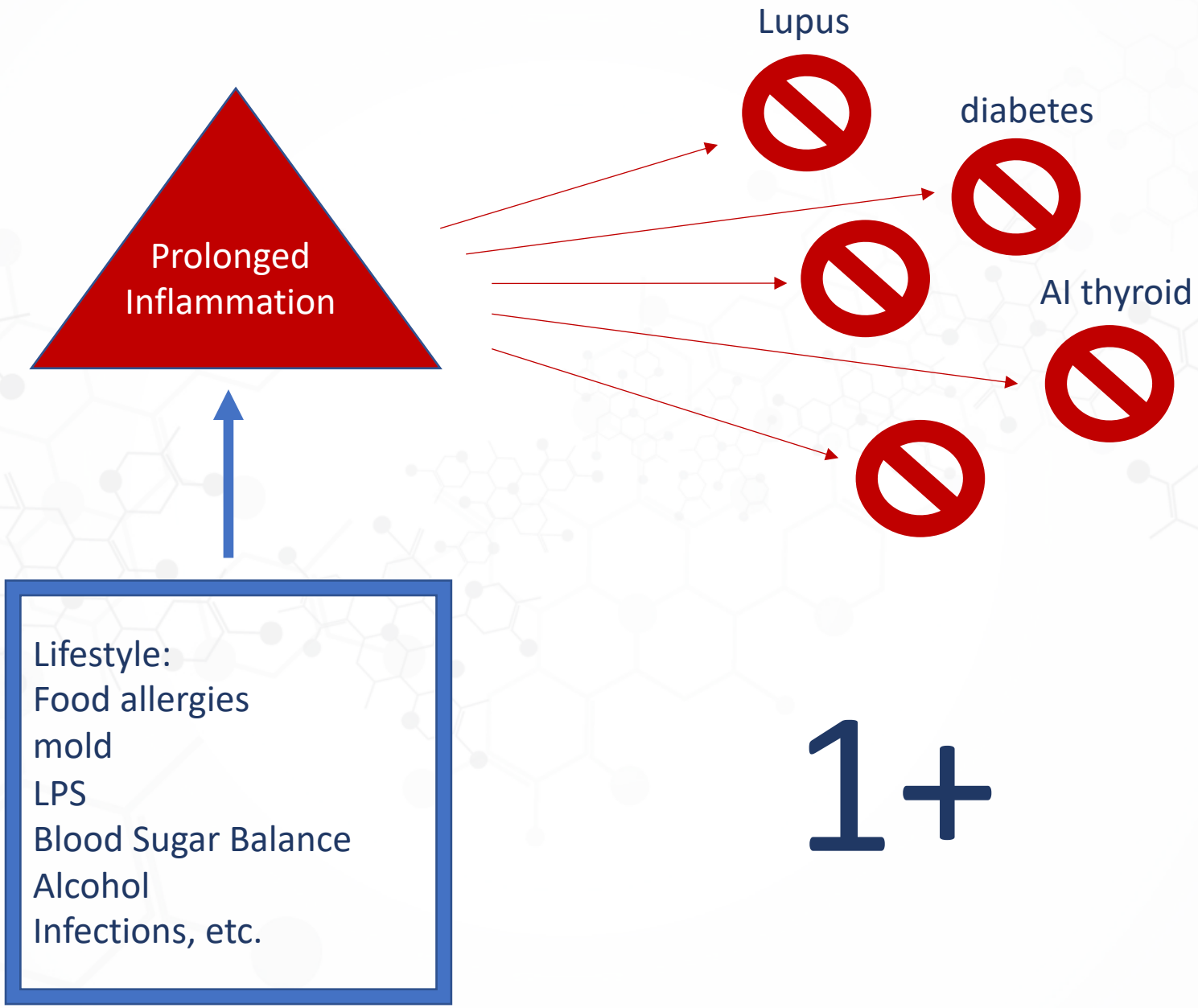
https://www.ncbi.nlm.nih.gov/books/NBK441832/

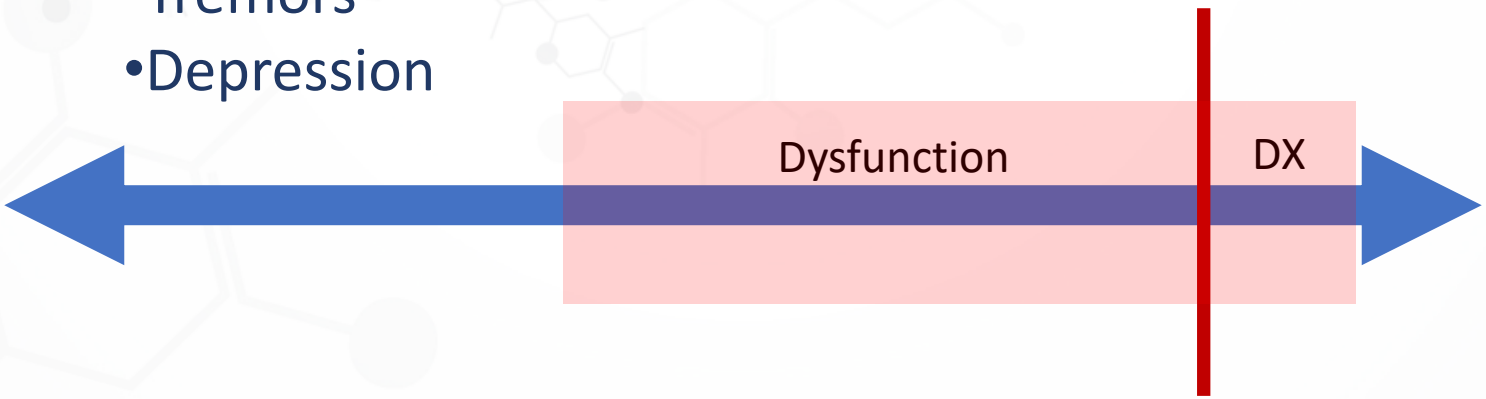
Primary adrenal insufficiency is characterized by decreased aldosterone and cortisol production due to diminished gland function. It can either present acutely, which may present as an adrenal crisis, or it can be chronic, which is called Addison disease.

The most common cause of primary adrenal insufficiency/Addison disease relates to the autoimmune destruction of the adrenal cortex. Autobodies form against the steroid 21-hydroxylase enzyme in approximately 90% of patients.


Lupus
diabetes
AI thyroid
Prolonged Inflammation
Lifestyle:
Food allergies
mold
LPS
Blood Sugar Balance
Alcohol
Infections, etc.
1+

Addison's Disease

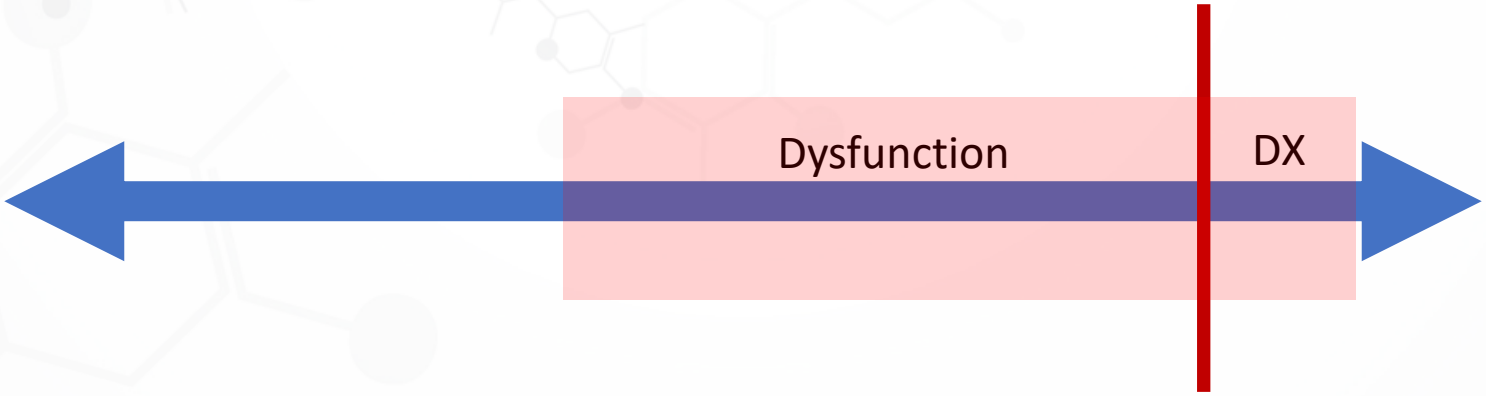
- Fatigue
- Body aches
- Unexplained weight loss
- Low blood pressure
- Lightheadedness
- Loss of body hair
- Skin discoloration (hyperpigmentation)
- Shaking
- Tremors
- Depression



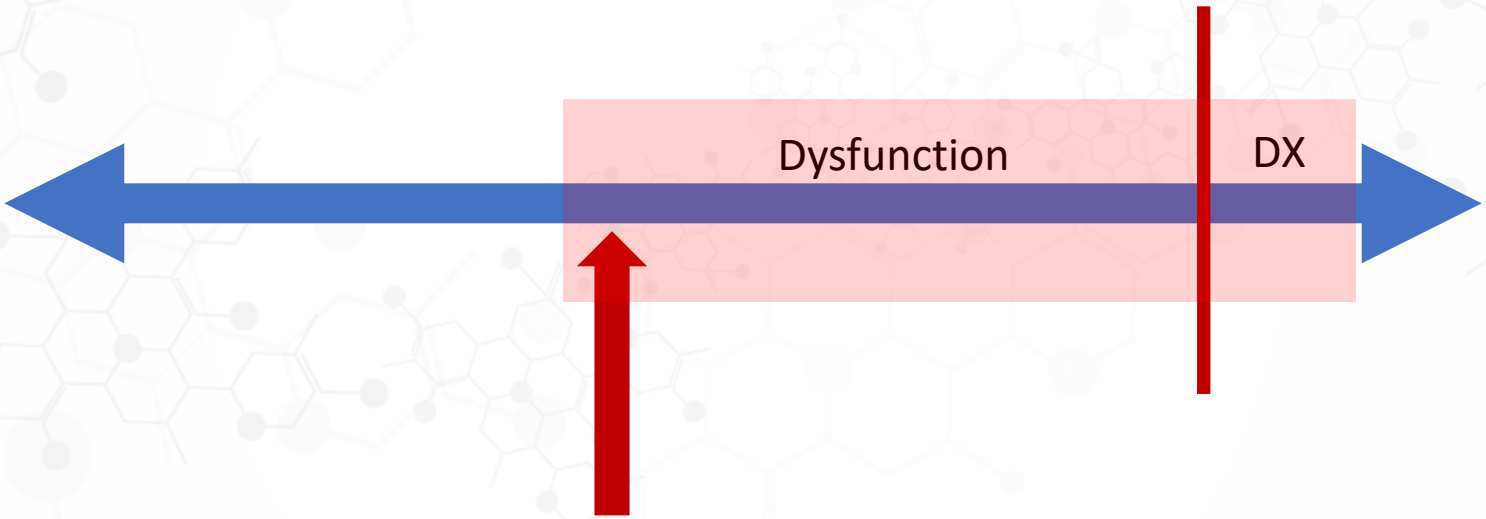
Cushing's Disease

- Weight gain
- Fatty tissue deposits
- Pink or purple stretch marks
- Bruise easily
- Slow wound healing
- Acne
- Hirsutism (thicker, more visible body hair)
- Irregular or absent menstrual periods
- Decreased libido, fertility, ED

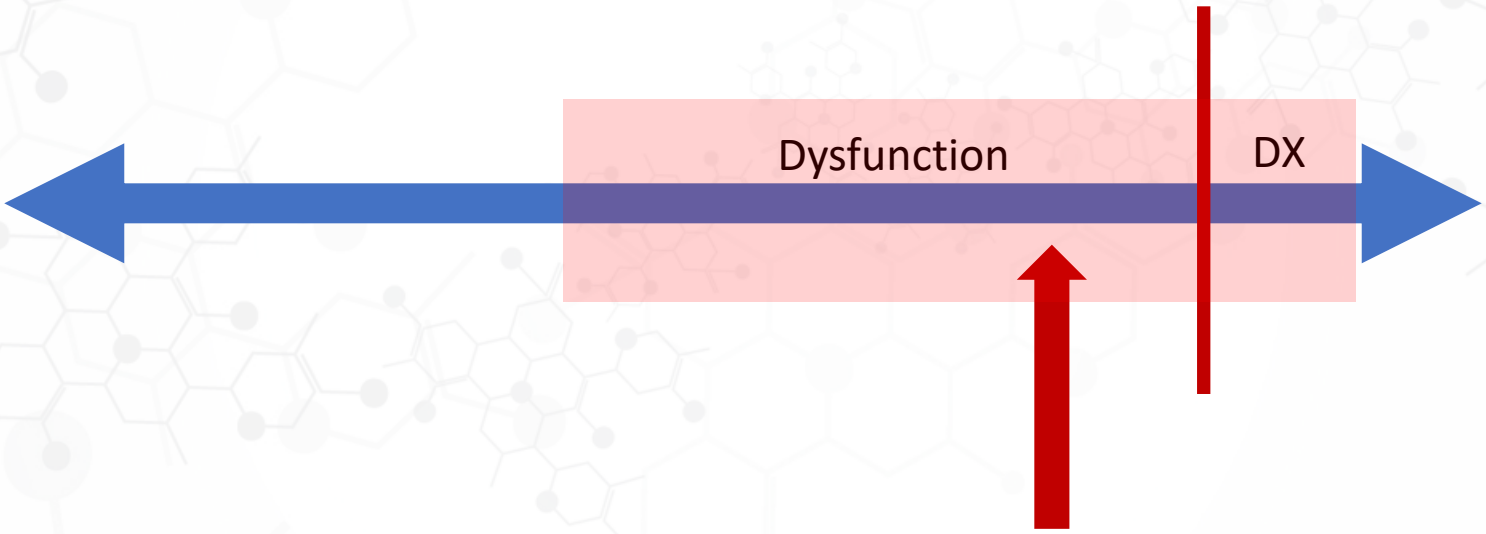
+ all of the symptoms associated with Addison's



Adrenal Assessment Measures



Adrenal Assessment Measures



Adrenal Assessment Measures

Adrenal Notes

Hormones Produced:

Cortisol

Aldosterone

DHEA and Androgenic Steroids

Epinephrine

Norepinephrine

Adrenal Notes

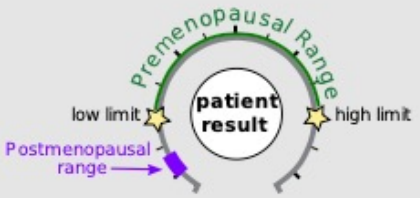
Hormones Produced:

- [x] Cortisol
- [ ] Aldosterone
- [x] DHEA and Androgenic Steroids
- [x] Epinephrine
- [x] Norepinephrine

PRECISION ANALYTICAL INC.
SIMPLY · BETTER · TESTING

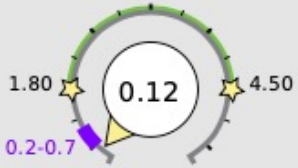
Hormone Testing Summary

Key (how to read the results):

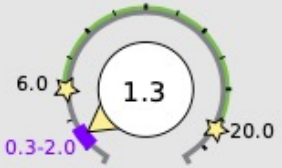


Sex Hormones

See Pages 2 and 3 for a thorough breakdown of sex hormone metabolites



Estradiol(E2)



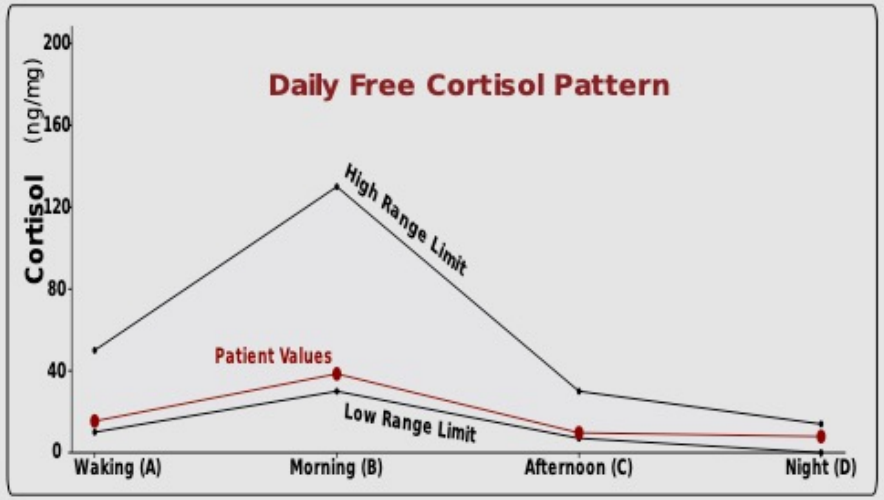
Progesterone
(Serum Equivalent, ng/mL)

Progesterone Serum Equivalent is a calculated value based on urine pregnanediol.

Testosterone

Adrenal Hormones

See pages 4 and 5 for a more complete breakdown of adrenal hormones



Total DHEA Production

Age	Range
20-39	1300-3000
40-60	750-2000
>60	500-1200

Total DHEA Production
(DHEAS + Etiocholanolone + Androsterone)

24hr Free Cortisol
(A+B+C+D)

cortisol metabolism

Metabolized Cortisol (THF+THE)
(Total Cortisol Production)

Free cortisol best reflects tissue levels. Metabolized cortisol best reflects total cortisol production.

65-year-old female, hashimoto's.
Symptoms: fatigue, dizziness, craving salty foods

Category	Test		Result	Units	Normal Range
Nutritional Organic Acids					
Vitamin B12 Marker (may be deficient if high) - (Urine)					
	Methylmalonate (MMA)	High end of range	1.9	ug/mg	0 - 2.2
Vitamin B6 Markers (may be deficient if high) - (Urine)					
	Xanthurenate	Within range	0.8	ug/mg	0 - 1.4
	Kynurenate	High end of range	5.9	ug/mg	0 - 7.3
Glutathione Marker (may be deficient if low or high) - (Urine)					
	Pyroglutamate	Low end of range	32.7	ug/mg	32 - 60
Neurotransmitter Metabolites					
Dopamine Metabolite - (Urine)					
	Homovanillate (HVA)	Low end of range	5.3	ug/mg	4 - 13
Norepinephrine/Epinephrine Metabolite - (Urine)					
	Vanilmandelate (VMA)	Within range	3.3	ug/mg	2.4 - 6.4
Melatonin (*measured as 6-OH-Melatonin-Sulfate) - (Urine)					
	Melatonin* (Waking)	Below range	4.1	ng/mg	10 - 85
Oxidative Stress / DNA Damage, measured as 8-Hydroxy-2-deoxyguanosine (8-OHdG) - (Urine)					
	8-OHdG (Waking)	Within range	2.2	ng/mg	0 - 5.2

65-year-old female, hashimoto’s.
Symptoms: fatigue, dizziness, craving salty foods

Hormone Testing Summary

Key (how to read the results):

Sex Hormones

Estradiol(E2)

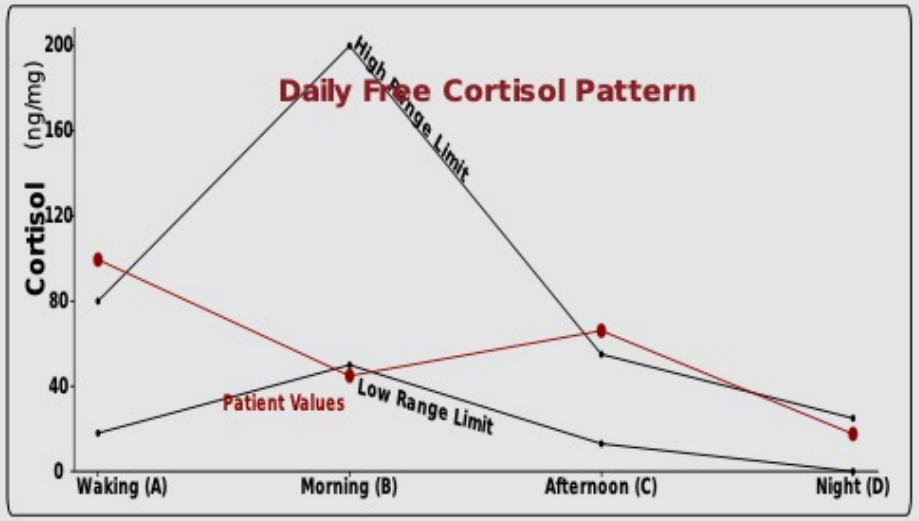
Testosterone

Testosterone

Age	Range
18-25	50-115
26-40	40-95
41-60	30-80
>60	25-60

Adrenal Hormones

See pages 4 and 5 for a more complete breakdown of adrenal hormones



Total DHEA Production

Age	Range
20-39	3000-5500
40-60	2000-4000
>60	1000-2500

Total DHEA Production
(DHEAS + Etiocholanolone + Androsterone)

24hr Free Cortisol
(A+B+C+D)

cortisol metabolism →

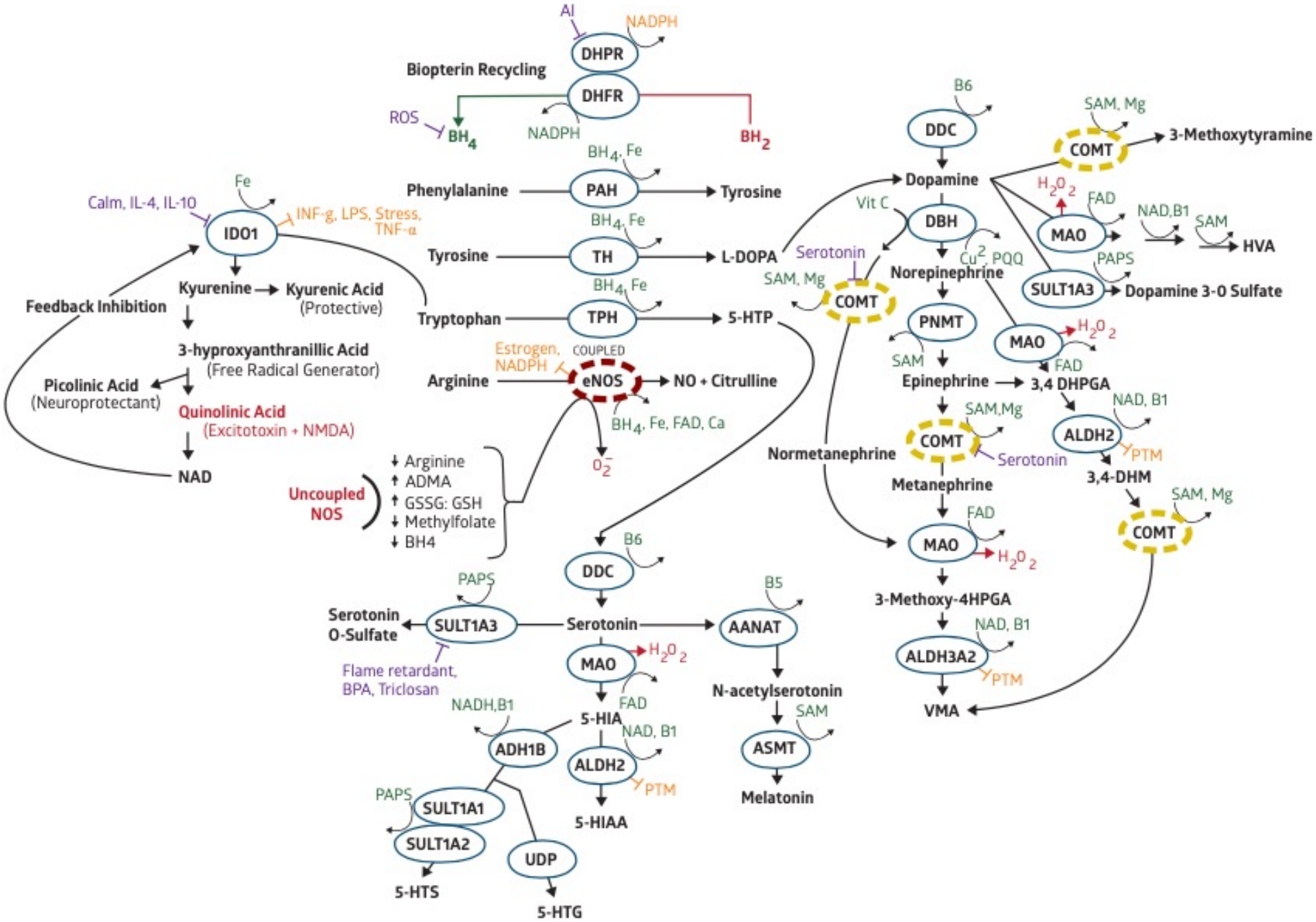
Metabolized Cortisol (THF+THE)
(Total Cortisol Production)

Free cortisol best reflects tissue levels. Metabolized cortisol best reflects total cortisol production.

64-year-old male, diabetes, hbp, obesity, ED.
Symptoms: fatigue, weight gain, decreased libido.

Category	Test		Result	Units	Normal Range
Nutritional Organic Acids					
Vitamin B12 Marker (may be deficient if high) - (Urine)					
	Methylmalonate (MMA)	Above range	5.3	ug/mg	0 - 3
Vitamin B6 Markers (may be deficient if high) - (Urine)					
	Xanthurenate	High end of range	1.7	ug/mg	0 - 2.1
	Kynurenate	High end of range	8.7	ug/mg	0 - 9.3
Glutathione Marker (may be deficient if low or high) - (Urine)					
	Pyroglutamate	High end of range	78.0	ug/mg	43 - 85
Neurotransmitter Metabolites					
Dopamine Metabolite - (Urine)					
	Homovanillate (HVA)	Low end of range	5.6	ug/mg	4.8 - 19
Norepinephrine/Epinephrine Metabolite - (Urine)					
	Vanilmandelate (VMA)	Within range	5.4	ug/mg	2.8 - 8
Serotonin Metabolite - (Urine)					
	5-Hydroxyindoleacetate (5HIAA)	Within range	7.3	ug/mg	3 - 10
Melatonin (*measured as 6-OH-Melatonin-Sulfate) - (Urine)					
	Melatonin* (Waking)	Low end of range	11.5	ng/mg	10 - 85
Oxidative Stress / DNA Damage, measured as 8-Hydroxy-2-deoxyguanosine (8-OHdG) - (Urine)					
	8-OHdG (Waking)	Within range	4.7	ng/mg	0 - 8.8

64-year-old male, diabetes, hbp, obesity, ED.
Symptoms: fatigue, weight gain, decreased libido.


Biopterin Recycling
DHPR
DHFR
NADPH
ROS
BH4
BH2
Phenylalanine
PAH
Tyrosine
Tyrosine
TH
L-DOPA
Tryptophan
TPH
5-HTP
Arginine
eNOS
NO + Citrulline
Calm, IL-4, IL-10
IDO1
INF-g, LPS, Stress, TNF-α
Feedback Inhibition
Kyurenine
Kyurenic Acid
(Protective)
3-hyproxyanthranillic Acid
(Free Radical Generator)
Picolinic Acid
(Neuroprotectant)
Quinolinic Acid
(Excitotoxin + NMDA)
NAD
Uncoupled NOS
↓ Arginine
↑ ADMA
↑ GSSG: GSH
↓ Methylfolate
↓ BH4
DDC
Dopamine
DBH
Norepinephrine
PNMT
Epinephrine
Normetanephrine
COMT
Metanephrine
MAO
3-Methoxy-4HPGA
ALDH3A2
VMA
3-Methoxytyramine
MAO
HVA
SULT1A3
Dopamine 3-0 Sulfate
MAO
3,4 DHPGA
ALDH2
3,4-DHM
COMT
SULT1A3
Serotonin O-Sulfate
Flame retardant, BPA, Triclosan
MAO
5-HIA
ADH1B
ALDH2
5-HIAA
SULT1A1
SULT1A2
5-HTS
UDP
5-HTG
AANAT
N-acetylserotonin
ASMT
Melatonin


Al
NADPH
DHPR
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DHFR
ROS
BH4
NADPH
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BH4, Fe
Phenylalanine
PAH
Tyrosine
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NAD
Estrogen, NADPH
COUPLED
Arginine
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BH4, Fe, FAD, Ca
O2-
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↑ ADMA
↑ GSSG: GSH
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B6
DDC
Dopamine
SAM, Mg
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H2O2
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HVA
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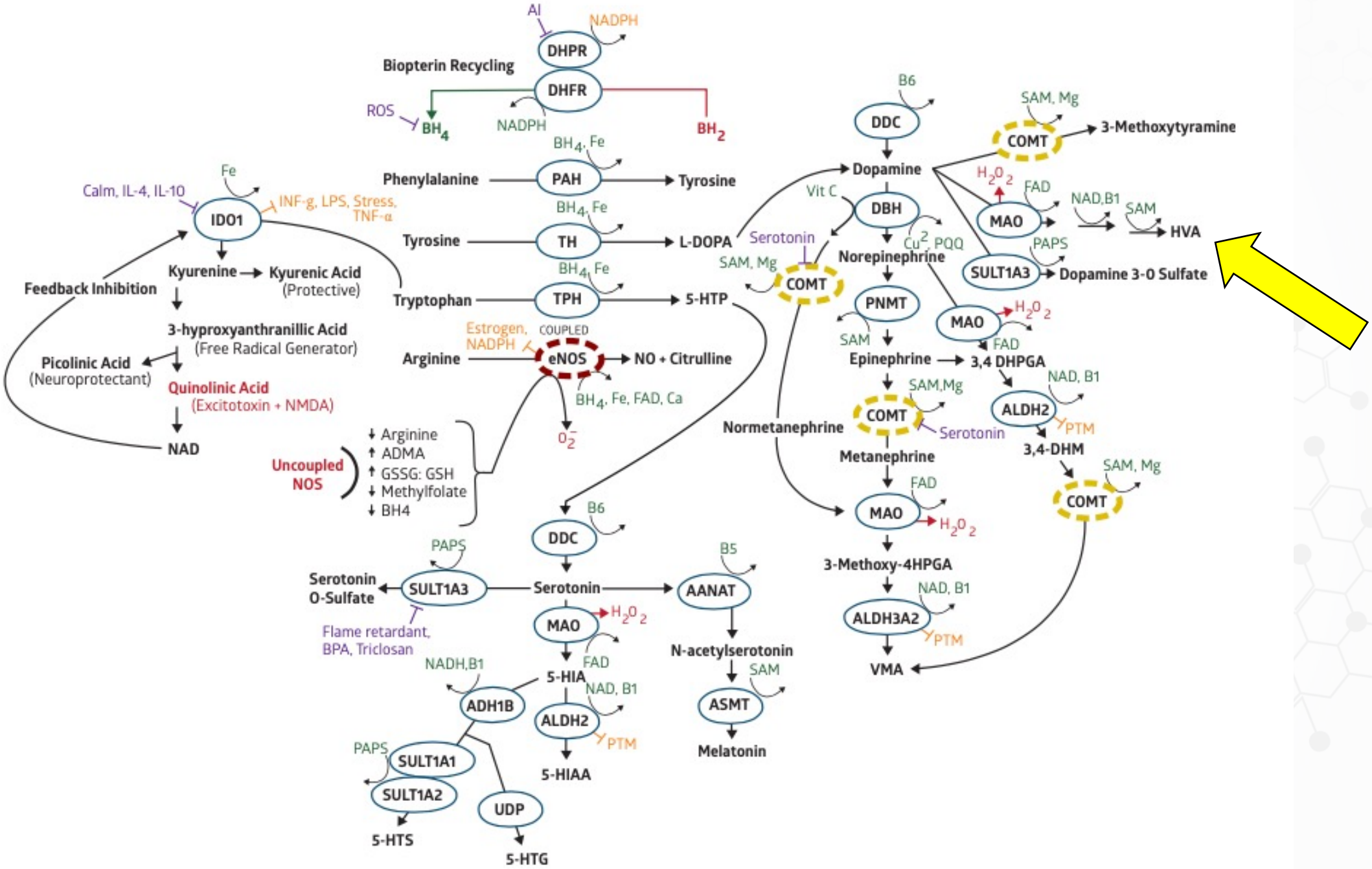
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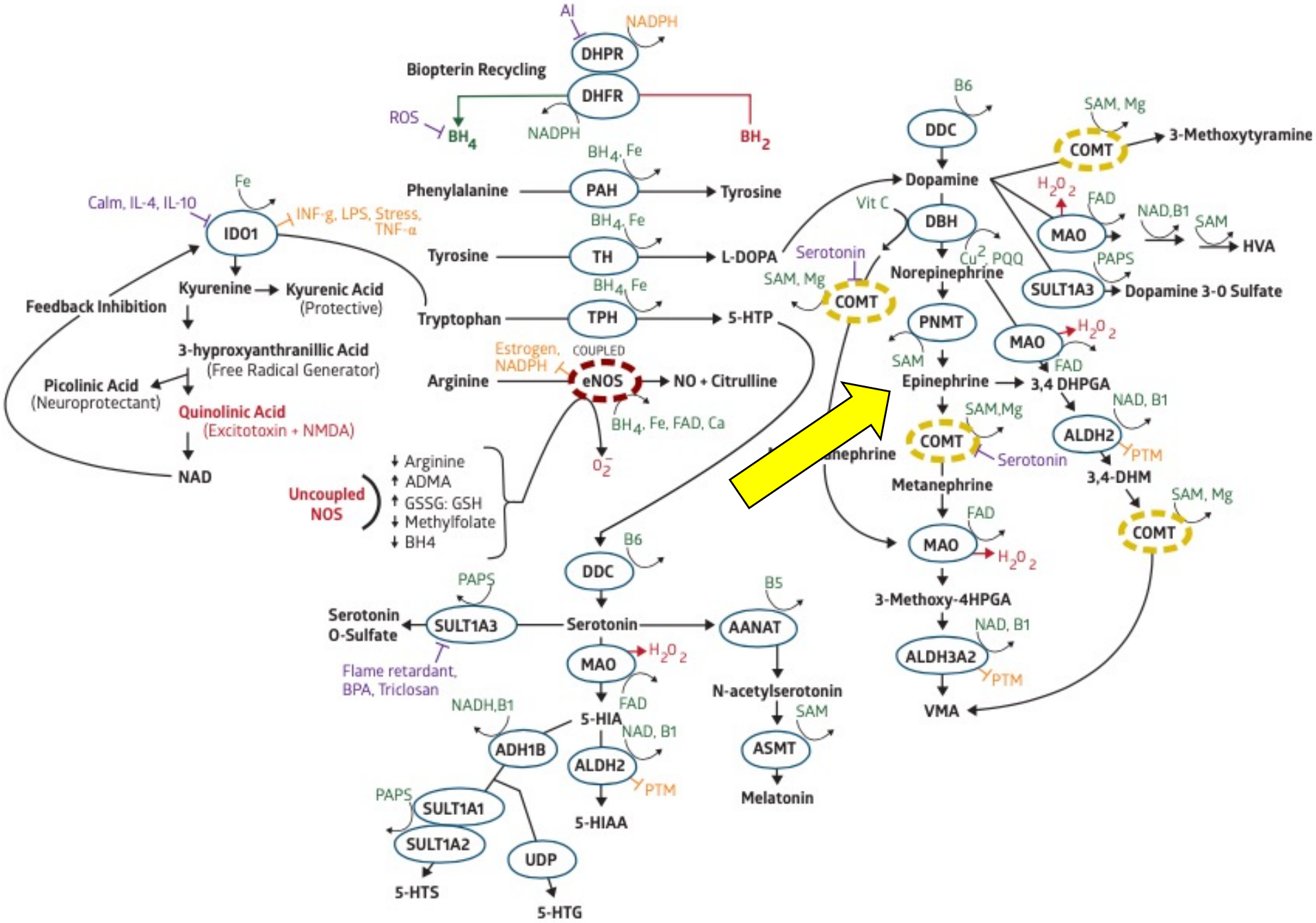
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Vit C
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MAO
HVA
SULT1A3
Dopamine 3-0 Sulfate
3,4 DHPGA
ALDH2
3,4-DHM
Metanephrine
3-Methoxy-4HPGA
ALDH3A2
VMA
Serotonin
SULT1A3
Serotonin O-Sulfate
Flame retardant, BPA, Triclosan
AANAT
N-acetylserotonin
ASMT
Melatonin
5-HIA
ADH1B
ALDH2
5-HIAA
SULT1A1
SULT1A2
5-HTS
UDP
5-HTG


Biopterin Recycling
DHPR
DHFR
NADPH
ROS
BH4
BH2
Phenylalanine
PAH
Tyrosine
Tyrosine
TH
L-DOPA
Tryptophan
TPH
5-HTP
Arginine
eNOS
NO + Citrulline
Calm, IL-4, IL-10
IDO1
INF-g, LPS, Stress, TNF-α
Feedback Inhibition
Kyurenine
Kyurenic Acid
(Protective)
3-hyproxyanthranillic Acid
(Free Radical Generator)
Picolinic Acid
(Neuroprotectant)
Quinolinic Acid
(Excitotoxin + NMDA)
NAD
Uncoupled NOS
↓ Arginine
↑ ADMA
↑ GSSG: GSH
↓ Methylfolate
↓ BH4
DDC
Dopamine
DBH
Norepinephrine
PNMT
Epinephrine
Normetanephrine
COMT
Metanephrine
MAO
3-Methoxy-4HPGA
ALDH3A2
VMA
3-Methoxytyramine
MAO
HVA
SULT1A3
Dopamine 3-0 Sulfate
MAO
3,4 DHPGA
ALDH2
3,4-DHM
COMT
Serotonin
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Flame retardant, BPA, Triclosan
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5-HIA
ADH1B
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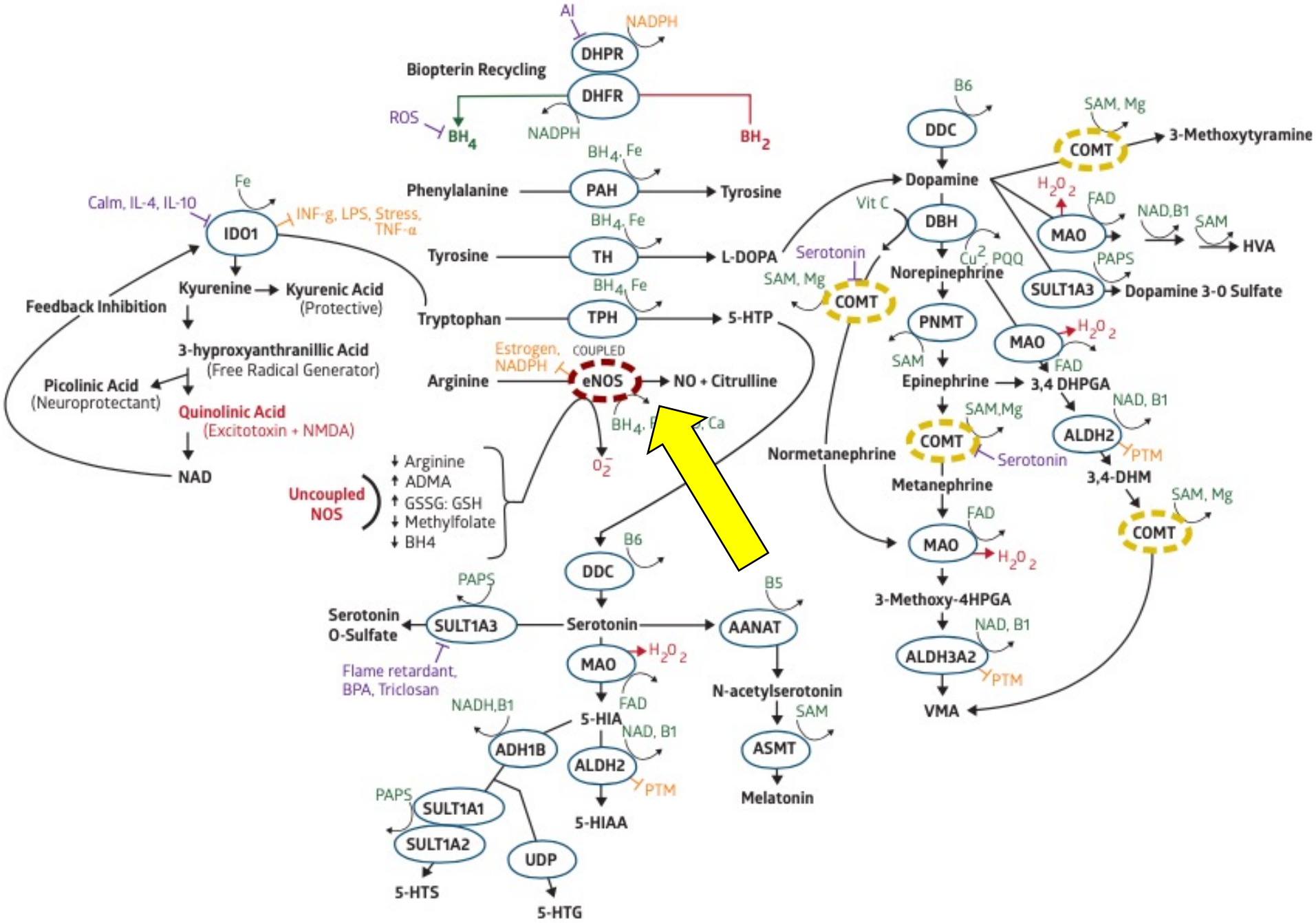
5-HIAA
SULT1A1
SULT1A2
5-HTS
UDP
5-HTG


Al
NADPH
DHPR
Biopterin Recycling
DHFR
ROS
BH4
NADPH
BH2
BH4, Fe
Phenylalanine
PAH
Tyrosine
Fe
Calm, IL-4, IL-10
IDO1
INF-g, LPS, Stress, TNF-α
BH4, Fe
Tyrosine
TH
L-DOPA
Kyurenine
Kyurenic Acid
(Protective)
Feedback Inhibition
BH4, Fe
Tryptophan
TPH
5-HTP
3-hyproxyanthranillic Acid
(Free Radical Generator)
Picolinic Acid
(Neuroprotectant)
Quinolinic Acid
(Excitotoxin + NMDA)
NAD
Estrogen, NADPH
COUPLED
Arginine
eNOS
NO + Citrulline
BH4, Ca
O2-
Uncoupled NOS
↓ Arginine
↑ ADMA
↑ GSSG: GSH
↓ Methylfolate
↓ BH4
B6
DDC
PAPS
Serotonin O-Sulfate
SULT1A3
Serotonin
B5
AANAT
Flame retardant, BPA, Triclosan
MAO
H2O2
FAD
N-acetylserotonin
NADH,B1
5-HIA
NAD, B1
ADH1B
ALDH2
PTM
SAM
ASMT
Melatonin
PAPS
SULT1A1
SULT1A2
5-HIAA
UDP
5-HTS
5-HTG
B6
DDC
Dopamine
SAM, Mg
COMT
3-Methoxytyramine
Vit C
DBH
H2O2
FAD
MAO
NAD,B1
SAM
HVA
Serotonin
Cu2, PQQ
Norepinephrine
PAPS
SULT1A3
Dopamine 3-0 Sulfate
SAM, Mg
COMT
PNMT
MAO
H2O2
SAM
FAD
Epinephrine
3,4 DHPGA
Normetanephrine
SAM,Mg
COMT
Serotonin
NAD, B1
ALDH2
PTM
Metanephrine
3,4-DHM
SAM, Mg
COMT
FAD
MAO
H2O2
3-Methoxy-4HPGA
NAD, B1
ALDH3A2
PTM
VMA


Biopterin Recycling
DHPR
DHFR
NADPH
ROS
BH4
BH2
Phenylalanine
PAH
Tyrosine
Tyrosine
TH
L-DOPA
Tryptophan
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SULT1A2
5-HTS
UDP
5-HTG
AANAT
N-acetylserotonin
ASMT
Melatonin

Protocols

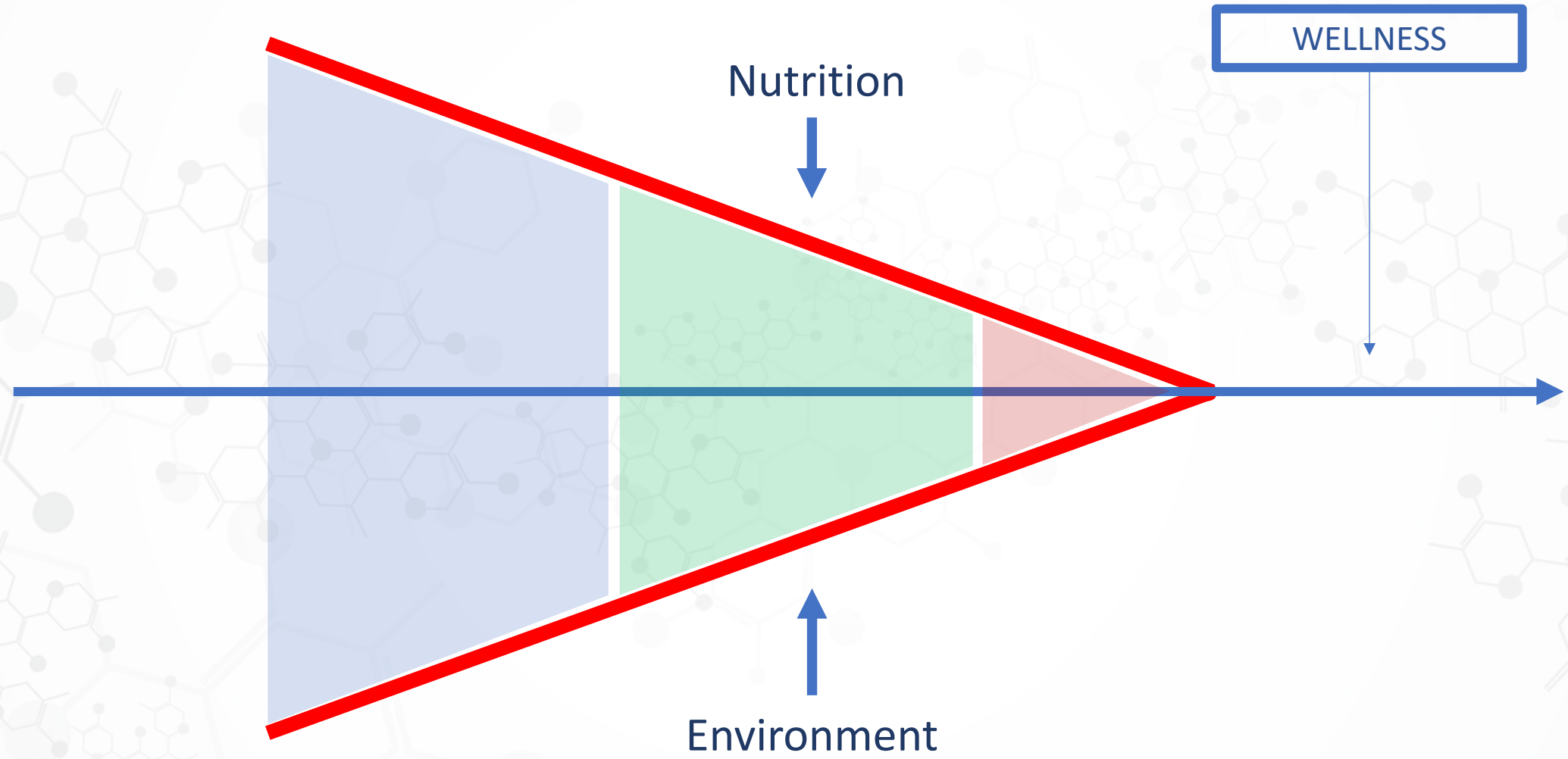
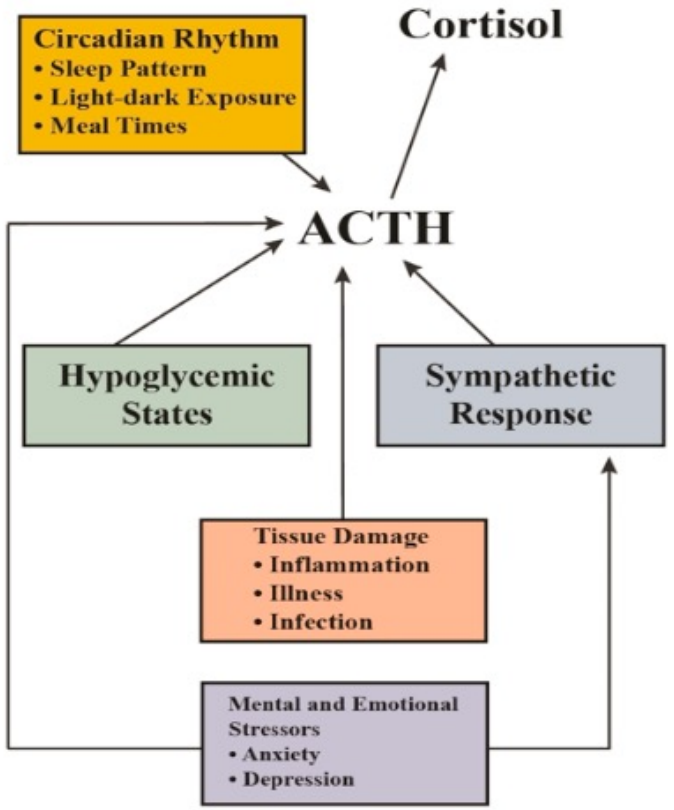


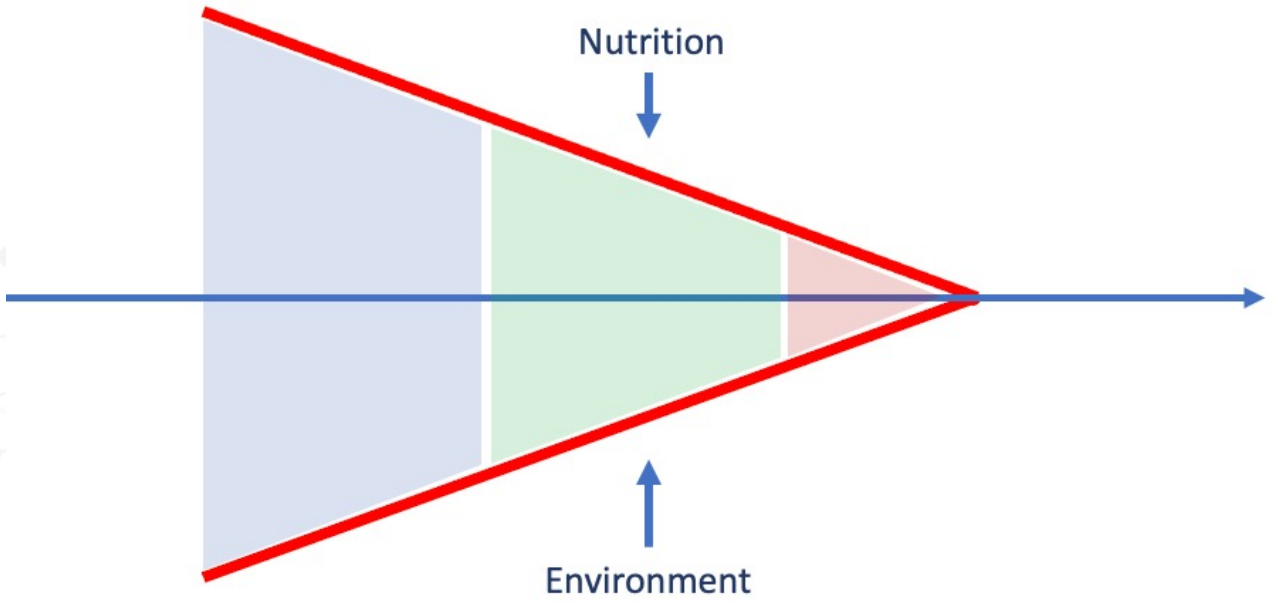
Figure 1:

Inducers of Cortisol Release

Inducers below must be individually examined for successful restoration of adrenals.



Hypaax Balance



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