Fasting, Nutrition & Hormones

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State of Health 2022

Only 7-8% of the population is metabolically healthy according to a recent article in the Journal of the American College of Cardiology

This is a public health crisis

Today we will discuss key strategies, including intermittent fasting, a form of hormesis, a beneficial stressor, that provides multiple health benefits along side nutrition and gender related differentiators that impact health and, overall, wellness

Will end with a discussion of how fasting can impact our hierarchy of hormones, including insulin, cortisol, estrogen, progesterone and testosterone

https://doi.org/10.1016/j.jacc.2022.04.046

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O'Hearn M, et al. J Am Coll Cardiol. 2022;80(2):138-151.

Fasting is the greatest remedy: the physician within

-Paracelsus

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Intermittent Fasting

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Dogma

Breakfast is the most important meal of the day

Calories in, calories out

What we eat is more important than when we eat

Eating snacks and mini-meals promotes blood sugar regulation and our metabolism

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What is Intermittent Fasting?

- Eating less often
- Eating within a prescribed time period, fasting within a prescribed time period
- You are deliberate about when you eat and when you fast and you make a conscious decision to eliminate a meal/s or snacks
- Public perception is that this is new or novel, but it dates back to Biblical times and is very aligned with an ancestral health perspective

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Common Intermittent Fasting Schedules

16/8
20/4
OMAD
5/2

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Benefits

- Lipolysis
- Promotes Gut Health
- Creates Metabolic Flexibility
- Enhances Mitochondrial Function
- Autophagy
- Enhances Brain Health
- Improves Longevity
- Reduces Inflammation
- Slows aging

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de Cabo R, et al. N Engl J Med. 2019;381(26):2541-2551.

Considerations

Gender differences

- Men
- Peak Fertility <35yo
- Perimenopause
- Menopause

Life stages

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Peak Fertility <35yo

- Protecting our infradian rhythm, aka our internal menstrual clock
- Follicular phase
- Ovulatory phase
- Luteal phase
- During each phase, our bodies adjust their energy levels, temperature, metabolism, insulin sensitivity, sleep quality

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Perimenopause

10-15 years preceding menopause

Signs: increasing variability in the length of our cycle, frequency of ovulation, and fluctuating levels of hormones

Symptoms: irregular menses, hot flashes, night sweats, sleep disturbances, mood changes, vaginal/bladder issues, changes in libido, heavier cycles, weight loss resistance

Anecdotal experience: this is the time period that acts as a barometer for how well women take care of themselves

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Menopause

- 12 months without a menstrual cycle
- Average age is 51yo in the United States
- 15% of women experience little-no symptoms
- More insulin resistance/higher BMI=worsening hot flashes and night sweats (Evernow Study)

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Practical Applications of Fasting

- Stop snacking
- Adjust macronutrients
- Clean fasting
- Starting with dinner: breakfast fasting
- Slowly opening the fasting window
- Highly bio-individual

Hormesis

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Hormesis

- Beneficial stress in the right amount at the right time
- When used in the proper amounts, it can make an organism stronger and more resilient
- Enhances overall health, beneficially slows aging and contributes to resilience
- Pushes you out of homeostasis and activates key mechanisms and signaling pathways that promote stress resilience, repairs cellular damage, repairs DNA, combats oxidative stress, produces new mitochondria, reduces inflammation, supports elimination of toxins, improves insulin sensitivity & reduces the risk for certain types of cancers (Robert Rountree, MD)

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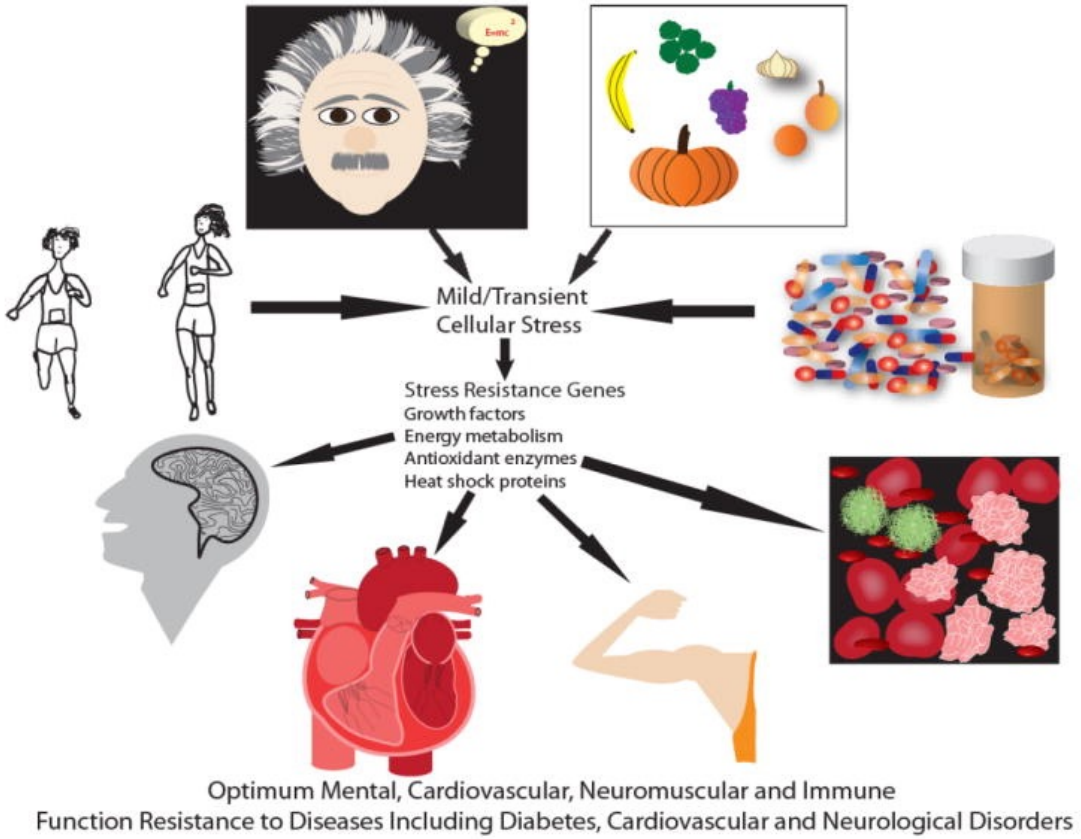
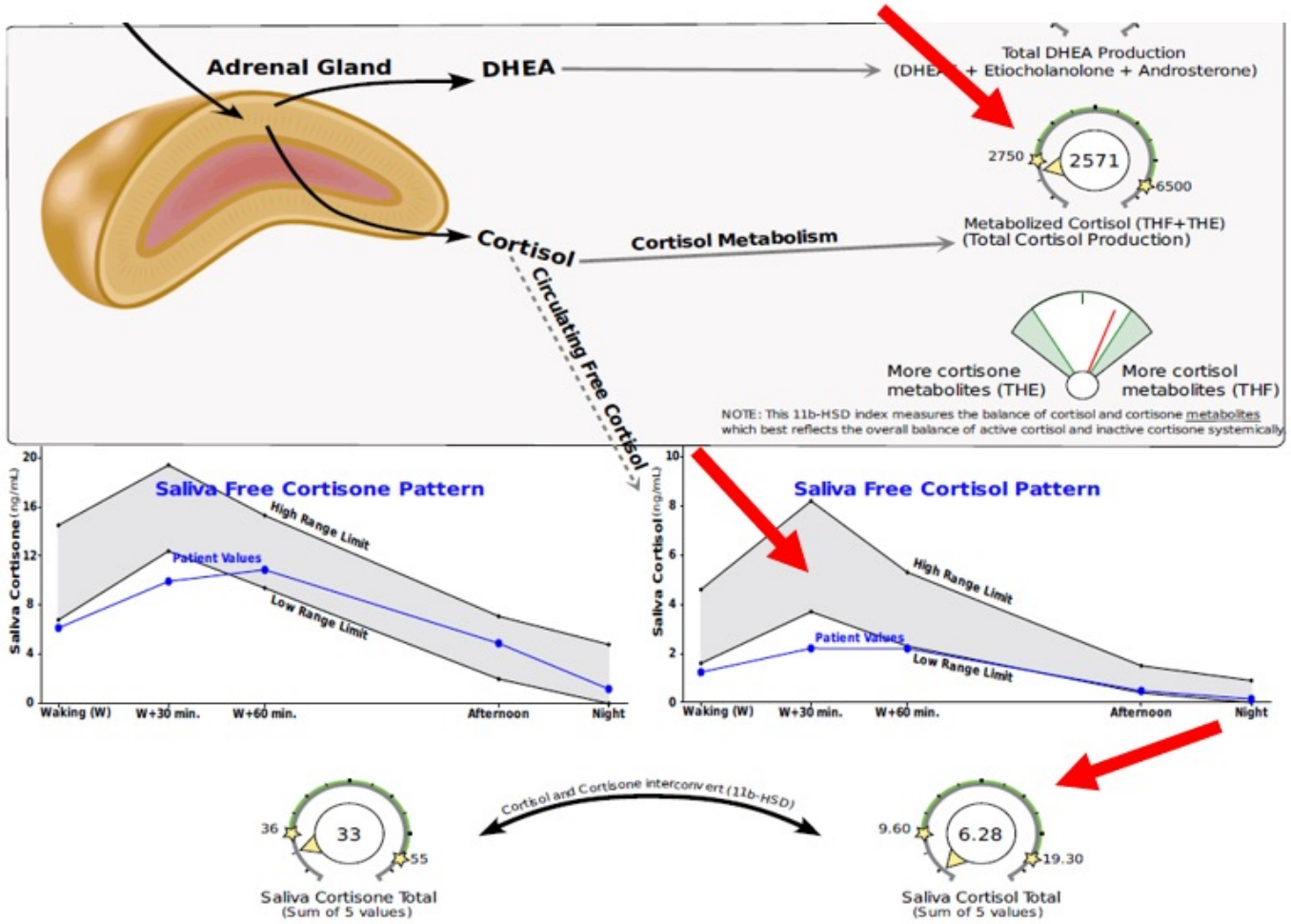
Hormetic Stressors



- Intermittent fasting
- Exercise, including HIIT, weight lifting
- Infra-red saunas
- Cryotherapy, ice baths, cold immersion
- Hypoxia, box breathing
- Specific phytonutrients/xenohormesis; examples: curcumin, broccoli sprouts, reservatrol, garlic, quercetin, green tea
- Learning new skills helps to build neuroplasticity

Mattson MP. Ageing Res Rev. 2008;7(1):1-7.

Example of chronic stress/DUTCH result



Prolonged stress and high cortisol are implied by the patient's history. Low overall cortisol is a common result of chronic stress.

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Nutrition

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Macronutrients

- Protein
- Fat
- Carbohydrates
- Ratios: bio-individual
- Eating for your cycle

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Protein

- Satiating
- Promotes Growth & Maintenance
- Stimulates bio-chemical reactions involving enzymes-proteins that regulate digestion, blood clotting, energy production & muscle contraction
- Building block of hormones
- Strengthens immune health
- Regulates fluid balance
- Maintains alkalinity and acidity

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Important considerations

PROTEIN IS CRITICALLY IMPORTANT FOR BUILDING AND MAINTAINING MUSCLE MASS

MUSCLE MASS IS IMPORTANT FOR INSULIN SENSITIVITY AND WARDING OFF INSULIN RESISTANCE

AIMING FOR 1GM/POUND OF IDEAL BODY WEIGHT

SELECT GRASS FED, ORGANIC, PASTURED ANIMAL PROTEIN OR PLANT-BASED OPTIONS THAT ARE LOWER IN CARBOHYDRATES

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Fat

Provide	Provide essential fatty acids
Help	Help transport and distribute fat soluble vitamins
Form	Form cellular membranes
Insulate and protect	Insulate and protect the body
Support	Support growth and development
Provide	Provide energy
Regulate	Regulate leptin
Enhance	Enhance the flavor of food

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Important considerations

- SMASH fish
- Avocado
- Coconut oil/MCT oil
- Butter/ghee
- Nuts/seeds/butters
- Avoid seed oils (canola, sunflower, safflower, cottonseed, soybean, etc)

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Carbohydrates

Unlike protein and fat, there are NO requirements for carbohydrates in our diets

Starches, sugars, fiber

Concept of low carb is especially helpful if you have weight to lose, are insulin resistant, leptin resistant and/or metabolically inflexible

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Carb cycling

Advanced technique with alterations in days of lower and higher carb based on physical activity and where you are in your menstrual cycle

Benefits include:

Regulates leptin and ghrelin for better appetite control

Improves insulin sensitivity

Promotes metabolic flexibility

Enhances lipolysis

Helps with weight loss resistance

Helps with variety and flexibility in food intake

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Anti-Inflammatory Nutrition

Focus on non-starchy vegetables, fruit, healthy fats, fatty fish, herbs and spices; protein

Avoid: gluten, dairy, processed sugars, watch ETOH

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Hormones

1. Master Hormones
2. Weight Control Hormones
3. Sex Hormones

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Master Hormones

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Balancing your master hormones

Role of HP-axis

Regulation of hunger, fatigue, sleep, body temperature & secretion of hormones

Partners with the pituitary gland, which communicates with the adrenals, thyroid, ovaries, testes and other glands

Pituitary gland secretes hormones that impact metabolism, growth, sexual development, reproduction, blood pressure and more

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Regulation

When the HP-axis is regulated properly, it helps maintain the delicate balance of hormones in response to biological needs, such as sleep, hunger, thirst and other things needed for survival

On the downside, imbalances are created by poor quality sleep, stress and types of foods we consume

3 Master Hormones

- Think of these as 3 conductors managing an orchestra
- Insulin
- Cortisol
- Oxytocin

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Insulin

Impacts other hormones, including our sex hormones: estrogen, progesterone and testosterone

By balancing insulin, these hormones can be maintained at more optimal levels

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Insulin: our key master hormone

- Helps shuttle glucose into our cells for energy
- It attaches to insulin receptors throughout our bodies instructing the cells to open up and let glucose in
- Important for maintenance of metabolic flexibility
- Role of glucagon: helps with maintenance of proper blood sugar levels
- Stored fuel: liver, muscles in the form of glycogen
- Stimulates the creation and storage of glycogen from glucose

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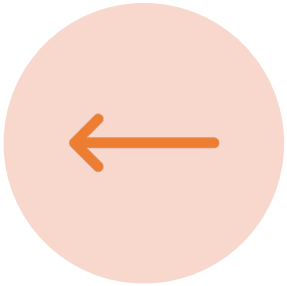
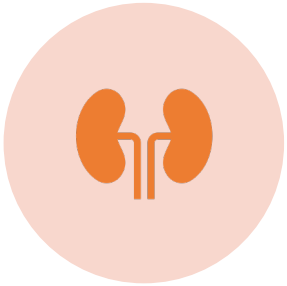
Fun Facts



The liver stores approximately 100gm of glycogen

Muscle glycogen content varies from person to person, but is approximately 500gm, according to a 2011 study published in Frontiers of Physiology; the storage is closely related to your diet and how much glycogen you burn off through exercise



Excess glycogen is converted into triglycerides and can be stored in adipose tissue

Excess carbohydrate consumption allows for insulin to inhibit lipolysis

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Imbalances

Elevated insulin, can be attributable to eating too much processed carbohydrates and can lead to IR

It can be impacted by chronic stress, as both high cortisol and high insulin negatively impact blood sugar levels to ensure that our muscles have a viable source of energy; cortisol will inhibit insulin production

High insulin/IR is related to metabolic inflexibility

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Insulin imbalances also make women susceptible

Estrogen dominance: PMS, endometriosis, ovarian cysts, heavy menses, fibrocystic breasts

Appetite changes/cravings

Disruption of serotonin/dopamine and impact hunger cues

PCOS: inflammation, insulin resistance, genetically abnormal theca cells in the ovary

Fluid retention

Glycogen=3-4 gms/water

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Fasting and Insulin

- Food intake is the impetus for insulin secretion
- If you are constantly eating, your insulin levels never normalize and you impact fat storage, develop insulin resistance and gain weight
- If you are fasting, your body's insulin levels are lower and your cells become more sensitive to insulin and your body can use up stored fuel, both glycogen and fatty acids for fuel
- 2018 study, researchers found that fasting reversed insulin resistance and allowed patients to be weaned off insulin therapy without altering their glucose levels, allowed them to lose weight and reduce their weight circumference

Furmli S, et al. BMJ Case Reports. 2018:bcr-2017-221854.

Cortisol

This must be balanced as well, if unbalanced, it impacts estrogen, testosterone and DHEA

DHEA/dehydroepiandrosterone: key vitality and anti-aging hormone

There is a delicate balance with your thyroid hormones, too

Excess cortisol can lead to insulin resistance

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Cortisol

- Major stress hormone
- Activated by the hypothalamus, which sends signals to the adrenal glands to secrete epinephrine into the blood stream, directing blood to your muscles, heart and vital organs
- If persistent, the hypothalamus releases corticotropin releasing hormone (CRH), which triggers the pituitary gland to release adrenocorticotropic hormone (ACTH), which acts on the adrenal glands to release cortisol
- Cortisol triggers the release of glucose to provide a means of fending off danger
- Sympathetic nervous system

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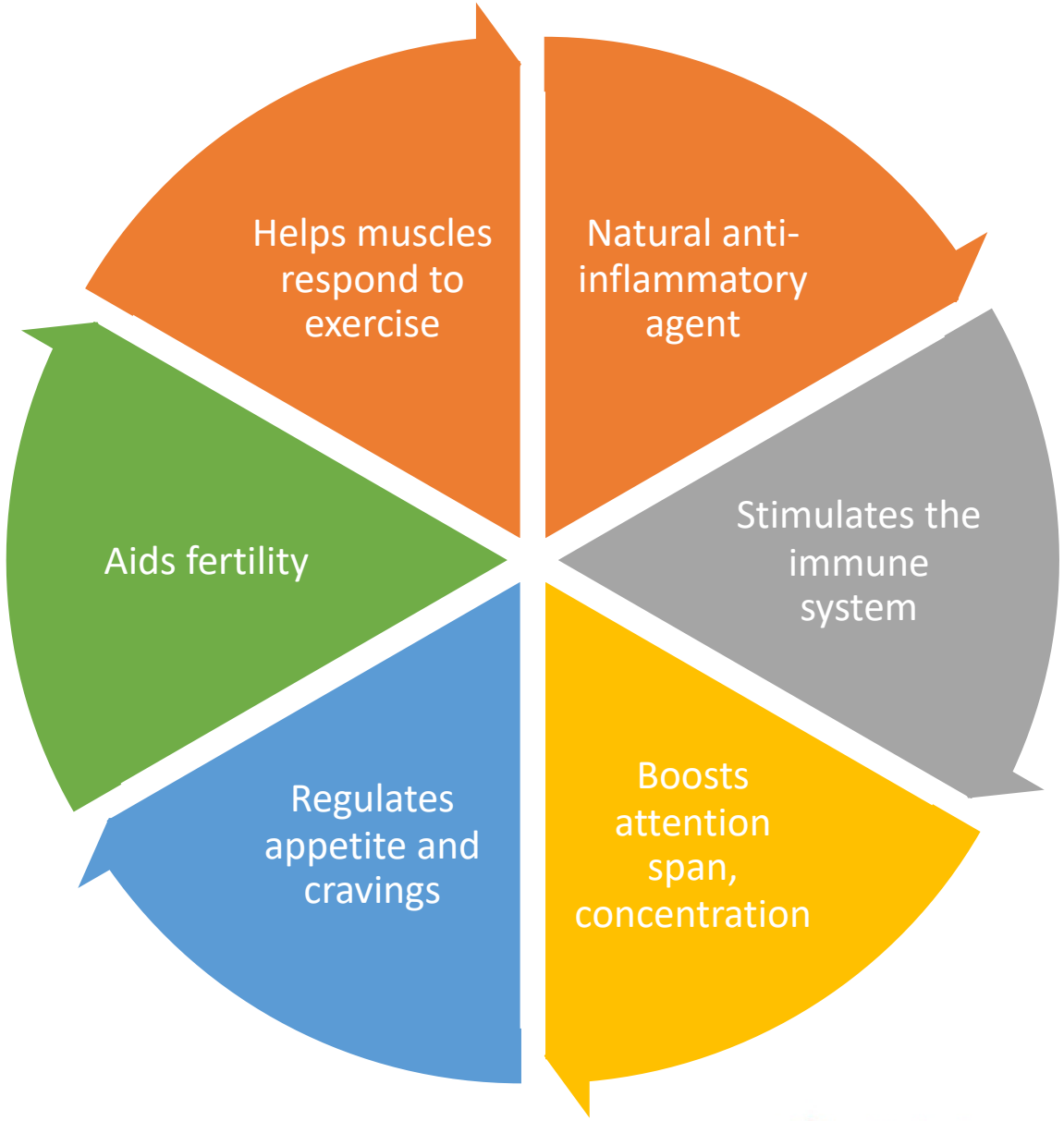
Additional roles of cortisol



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Impact of chronic stress/chronic high cortisol levels

Sympathetic dominance

Role of the amygdala and over-riding the prefrontal cortex

Challenge: loss of executive functioning in chronic stress states

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What does cortisol do if chronically elevated?

Impact of persistent stress

Impacts the production of hormones, including insulin, oxytocin, and our sex hormones, progesterone, estrogen, testosterone

Leads to chronic inflammation, high insulin, lowered immunity, digestive distress, sleep disturbances, etc

Visceral fat storage (40x more cortisol receptors); mobilizes triglycerides from storage and relocating them to the viscera aka cortisol belly

High blood sugar creates higher cortisol levels that promote visceral fat; excess cortisol stimulates gluconeogenesis

Boosts your appetite and cravings for high carb foods

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Study

UCSF study: premenopausal women who secreted more cortisol during and after simulated stress provoking situations in the lab chose to eat more foods high in sugar and fat

Giving into cravings leads to weight gain

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Fasting and Cortisol

Concept of hormesis

If you are under a great deal of stress, this is probably not the right time to embrace this strategy

Sleep, stress, nutritional choices, exercise all impact cortisol, positively or negatively

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Oxytocin

Our hormone of connection, love and bonding that is produced in the hypothalamus and stored and secreted into the bloodstream from the pituitary gland

It is also released in the brain, uterus, placenta, ovaries and testes

It is also found in the digestive tract and helps stimulate gastric juices and hormones so your body can absorb your nutrition

Released during breastfeeding and helps a mother bond with her child

Released during sexual intimacy, particularly during orgasms

Our multi-purpose hormone, as it keeps cortisol in balance and improves insulin sensitivity

It also has a positive net impact on our sex hormones, too

Oxytocin and Menstruation

Fluctuates throughout your menstrual cycle, peaking around ovulation and decreases during your luteal phase

It allows for our cells to be more insulin sensitive, which contributes to metabolic flexibility

Oxytocin and Cortisol

Oxytocin can counteract the effects of cortisol, which can help manage stress levels

If our oxytocin levels are healthy, we will feel happy and peaceful, healthy libido

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Oxytocin Imbalances

Little-no pleasure in sex

Inability to attach in relationships

No interest in social connections

A feeling of being chronically stressed

Depression and anxiety

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IF and Oxytocin

Enhancing oxytocin levels can help by suppressing hunger and cravings

Studies have shown that oxytocin helps dieters be more satiated and experience fewer between meal cravings

Remember that oxytocin hits last 3-5 minutes in duration, so get your hugs, snuggles and kisses in throughout your day

Weight Control Hormones

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Weight Control Hormones

All hormones have ability to impact your weight considering that they collectively effect metabolism, appetite, muscle tissue, metabolic flexibility, stress levels, sleep and water retention

Cortisol

Insulin

Leptin

Ghrelin

Glucagon

Growth Hormone

Norepinephrine

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Leptin

discovered in 1994

Produced in mostly in white fat cells (adipocytes), as well as brown fat tissue, ovaries, skeletal muscle, the lower part of our stomachs

If working properly, you eat to a point of satiety and not crave more food; it is integral in weight maintenance

Roles of Leptin

- Burns triglycerides for fuel
- Helps turn white fat into brown fat
- Governs fat storage
- Affects exercise
- Involved in bone formation
- Regulates immune and inflammatory responses
- Helps create new blood cells and vessels
- Assists in wound healing
- Initiates puberty
- Controls blood pressure, heart rate, thyroid function and our menstrual cycle

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Imbalances

Leptin resistance: typically accompanies metabolic inflexibility and insulin resistance

Symptoms: food cravings, lack of satiety

Signs: weight loss resistance

Causes: obesity, insulin resistance, highly processed/hyper palatable foods, insomnia, lack of exercise; exposure to toxins, like mycotoxins and/or CIRS

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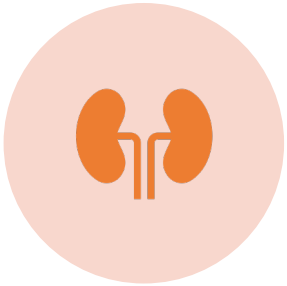
Ghrelin



Appetite stimulation, increases food intake, promotes fat storage

According to the Society of Endocrinology, adults who were given ghrelin increased their food intake by 30% (StuDY)

Produced and released in the stomach, with small amounts secreted by our small intestine, pancreas and brain

Regulated by the parasympathetic nervous system

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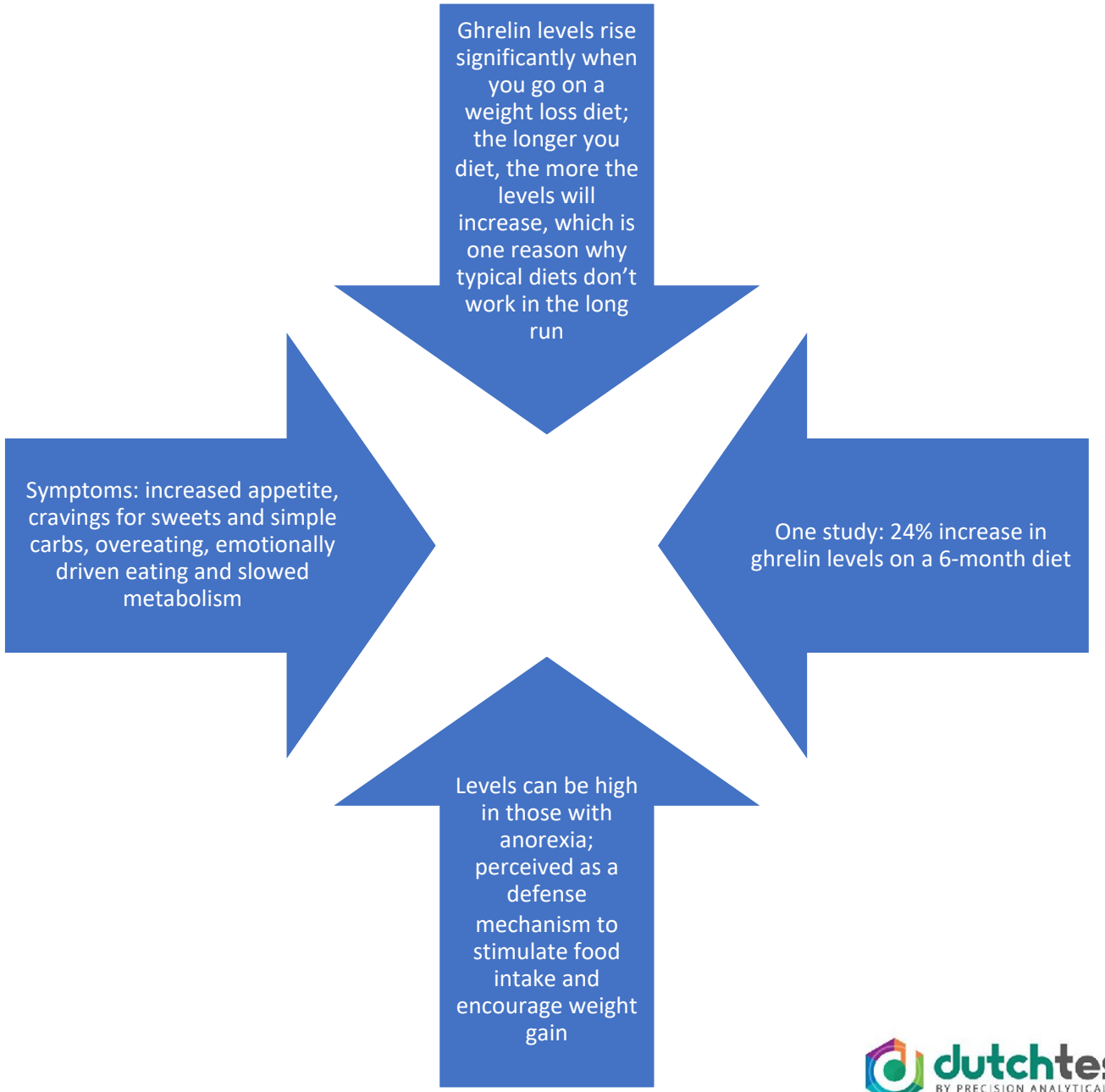
Imbalances



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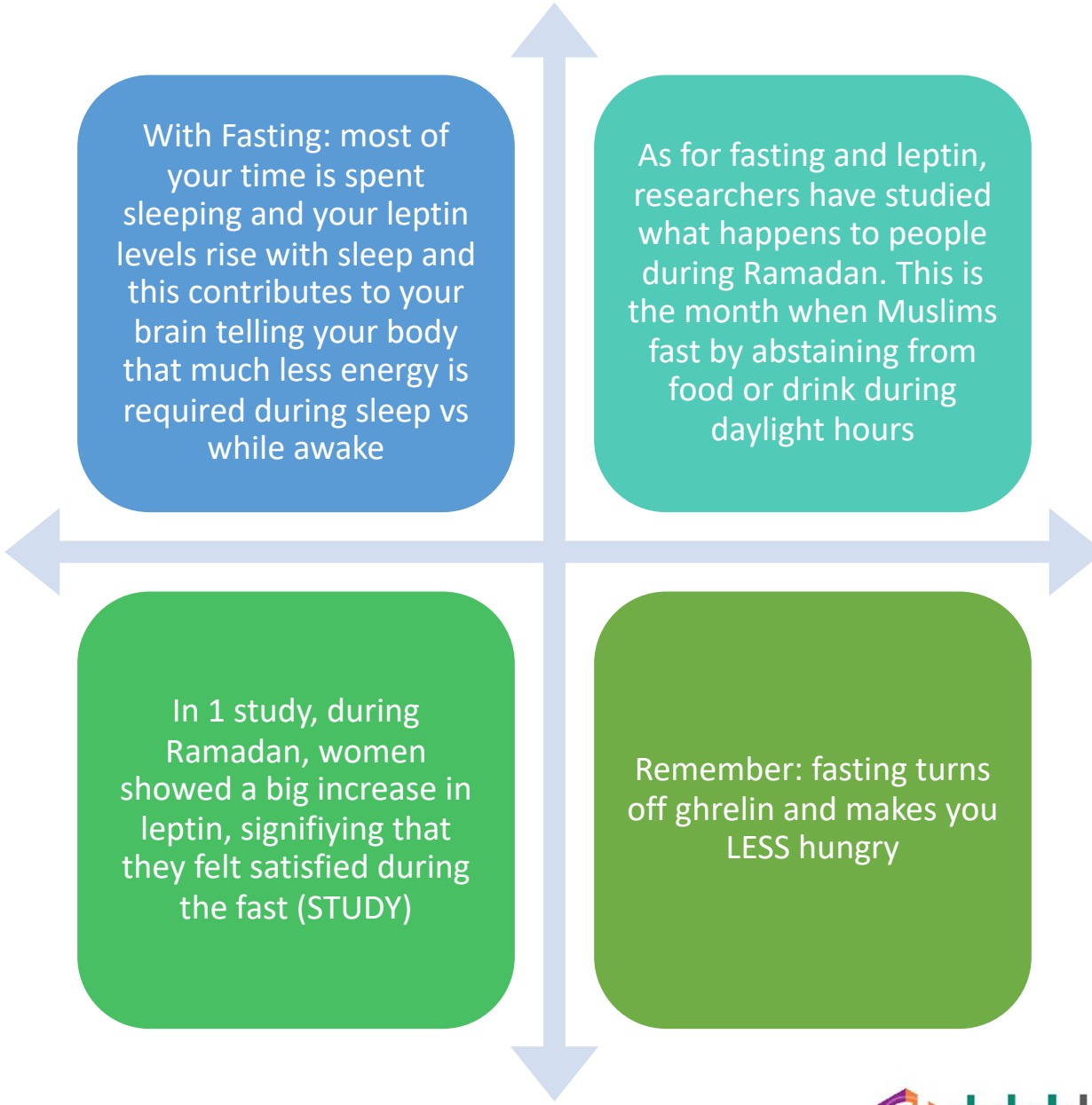
Intermittent Fasting & Hunger Hormones



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Studies

In one study, participants went on a 33-hr fast, in which grehlin was measured every 20 minutes

Results: ghrelin stayed stable throughout the fast; this represents that not eating for 33-hrs made you no more or less hungry than when you began; whether you ate or did not eat, your hunger stayed the same (STUDY)

In another study, over 3 days of fasting, ghrelin gradually decreased. The participants were far less hungry, despite not having eaten for 3 days (STUDY)

A study in the journal of Obesity looked at a 16:8 fasting method and found that after 4 days of eating in an 8-hr feeding window, fasters had lower ghrelin levels overall and said their hunger level was pretty low; takeway: when you are not eating, you're not secreting insulin, and your blood sugar isn't fluctuating up and down, so you will experience less hunger and cravings

Takeaway, while fasting, your hunger does not increase to unmanageable levels when you fast, rather it decreases

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Other Hunger Hormones

Neuropeptide Y (NPY): found mostly in the hypothalamus, NPY delays the feeling of fullness throughout a meal. Leptin helps to stop the firing of NPY, shutting off the signal to eat

Peptide YY (PYY): manufactured in the intestines after you eat. It then enters your bloodstream and travels to the hypothalamus, where it hinders NPY, decreasing your appetite

Choleycystokinin (CCK): the 1st satiety hormone to be discovered, CCK is secreted in the GI tract, especially in the small intestine. CCK rises quickly after you eat, and it triggers the first release of PYY

Glucagon-like-peptide-1: (GLP-1): this is secreted by your digestive tract after you eat. It acts as a satiety hormone, helping you feel full

Adiponectin: this hormone helps improve insulin sensitivity and balance blood-sugar levels so that you do not feel hungry and overeat, it is also involved in fat burning

Sex Hormones

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Sex hormones

- Estrogen
- Progesterone
- Testosterone

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Estrogen

Collective name for a trio of hormones: estradiol, estrone and estriol

Estradiol (E2) is the form that predominates in our peak fertile years and it is the most powerful

Estriol (E3) accounts for 10% of our total estrogen, but predominates in pregnancy when it is produced by the placenta

Estrone (E1) is the dominant form in menopause and is created primarily in our fat cells, ovaries and adrenal glands; it is a weaker form of estrogen than estradiol

Imbalances in estrogen

- Can be attributable to endogenous, as the body is making too much estrogen and it is not properly metabolized or eliminated

OR

- Can be related to exogenous exposure in our environment, personal care products or food not properly eliminated in the body

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Endogenous estrogen

Can be impacted by
A fiber deficient diet
Stress (DUTCH example)
ETOH use
Caffeine
Impaired liver detoxification (DUTCH example)
Estrobolome health (beta-glucuronidase)

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Exogenous estrogen

- Xenoestrogens
- Foreign and destructive estrogens in our environment, personal care products and food that have estrogen like effects
- They mimic our natural hormones and can block or bind to receptors, creating harmful imbalances
- Unfortunately, xenoestrogens are not biodegradable, so they can be lodged into fat cells and can be difficult to eliminate from the body
- These are implicated in breast cancer, obesity, infertility, endometriosis, early puberty and diabetes

Fernandez SV, Russo J. Estrogen and Xenoestrogens in Breast Cancer. *Toxicologic Pathology*. 2010;38(1):110-122. doi:10.1177/0192623309354108

Lin, JY., Yin, RX. Exposure to Endocrine-Disrupting Chemicals and Type 2 Diabetes Mellitus in Later Life. *Expo Health* (2022). https://doi.org/10.1007/s12403-022-00486-0

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IF and Estrogen

Understanding your follicular phase of your menstrual cycle

Our body attempts to optimize estrogen by producing the right amount of hormones and by eliminating excess

Fasting supports the interplay of estrogen and growth hormones; fasting increases growth hormone, which helps maintain optimal estrogen levels through proper signaling

Fasting helps support autophagy that can help eliminate toxic estrogen from the body

Fasting supports the gut microbiome and especially the estrobolome, to help detoxify and eliminate estrogen from the body

Research on fasting and breast cancer further supports this practice with reductions in recurrence

Marinac CR, Nelson SH, Breen CI, et al. Prolonged Nightly Fasting and Breast Cancer Prognosis. *JAMA Oncol.* 2016;2(8):1049–1055. doi:10.1001/jamaoncol.2016.0164

Progesterone

Plays a key role in menstruation, pregnancy and formation of embryos

Produced in the ovaries and placenta until menopause and then in the adrenal glands

It balances estrogen, is responsible for breast development, helps regulate sleep and body temperature, assists in bone formation, maintains blood sugar levels and supports thyroid function

Works closely with the neurotransmitter GABA (gamma-aminobutyris acid) to have a calming effect on the brain

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Imbalances in progesterone

- Impacted by life stage, as we transition into perimenopause and menopause
- Stress
- Thyroid health
- Low Vitamin A, B6, C and zinc
- Excessive processed sugar intake
- Symptoms: anxiety/depression, insomnia, heavier cycles, migraines, PMS

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IF and Progesterone

Understanding	Understanding how to fast during your luteal phase of your menstrual cycle
Avoiding	Avoiding fasting 5-7 days prior to your menstrual cycle

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Testosterone

- Important for libido and sexual desire
- Builds bone and prevents it from deteriorating
- Maintains muscle mass
- Helps maintain memory
- Increases your sense of emotional well-being, self-confidence and motivation
- Needs estradiol optimized to function properly

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Testosterone Imbalances

Peaks at age 25

With menopause, the natural production of testosterone declines by 50%, this can lead to issues with building and maintaining muscle, which impacts glucose control/insulin sensitivity, body composition and other metabolic actions

DUTCH slide

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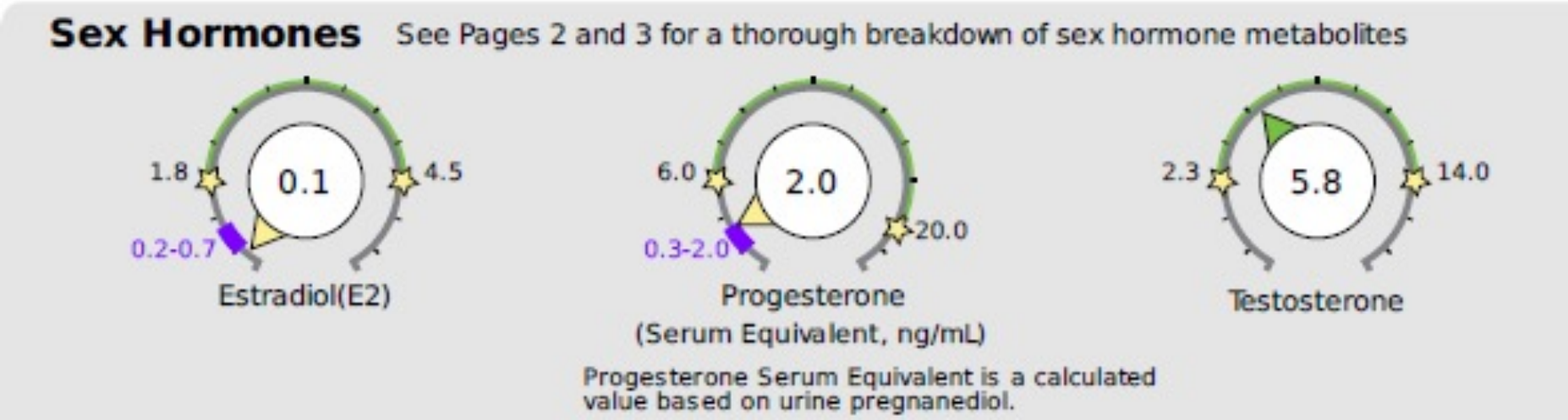
Postmenopausal Sex Hormones



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IF and Testosterone

Fasting helps balance insulin sensitivity, which has a positive net impact on testosterone levels

Journal of Clinical Endocrinology and Metabolism demonstrated that fasting lowered levels of leptin and this decrease created and immediate surge in testosterone

Luukkaa V, et al. J Clin Endocrinol Metab. 1998;83(9):3243-3246.,

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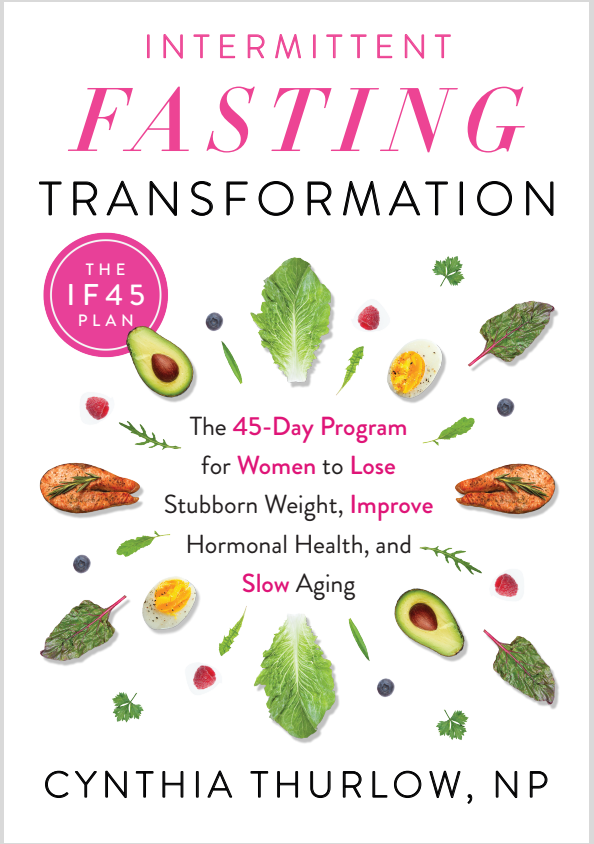

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