Mapping The Perimenopausal Metabolic Switch

Tanya Borowski

Head of Education

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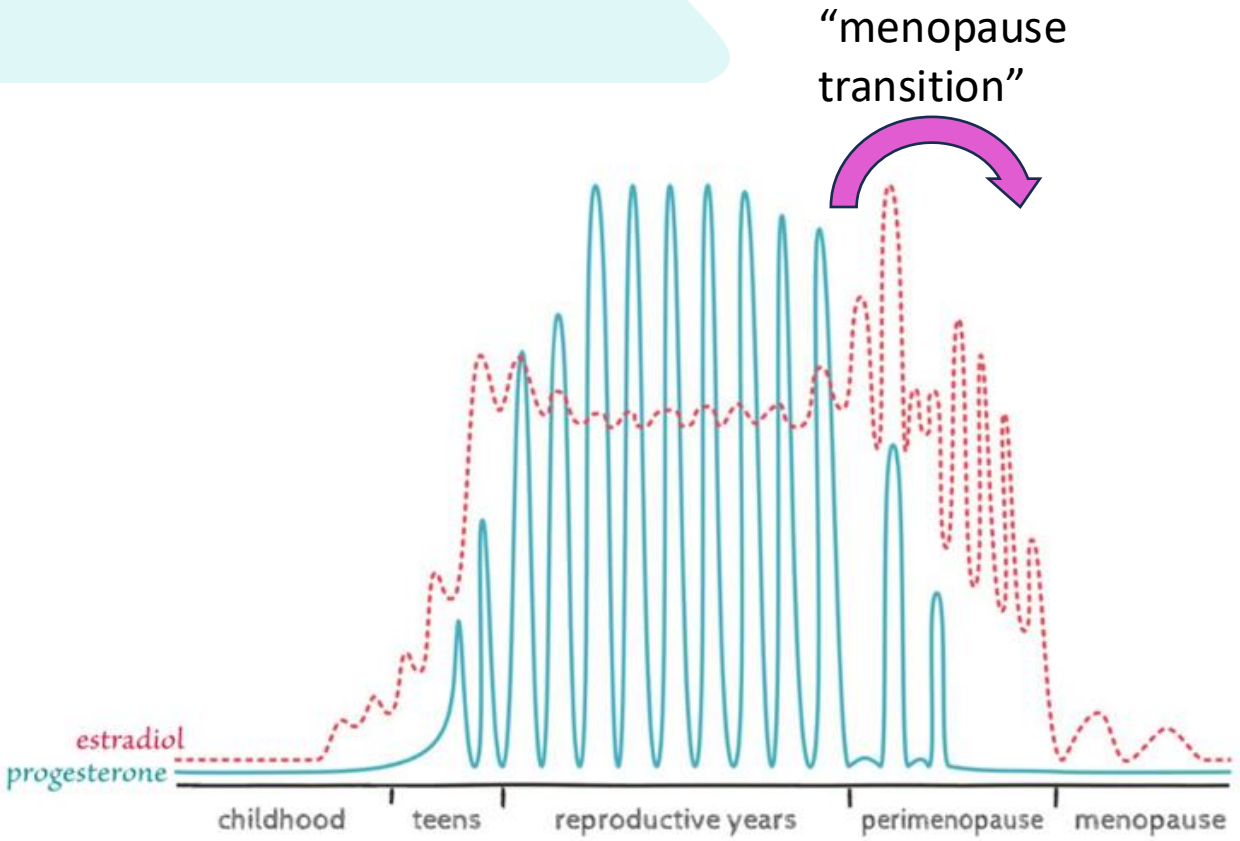
The hormonal journey

- At a young age women react strongly to oestrogen - receptors are super sensitive
- Not ovulating to counterbalance oestrogen = heavy periods in teens
- Can take up to 12 years to mature menstrual cycle
- **Perimenopause** – the isomer of menarche



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Nomenclature

perimenopause / the menopause transition

noun [C]

Perimenopause is the two to twelve years before menopause. It can be the time of greatest symptoms.

menopause Also called post-menopause

noun [C]

Menopause is the life phase that begins one year after the last period. It is usually the time of almost no symptoms.

Nomenclature

The Stages of Reproductive Aging Workshop (STRAW +10) system is a defined set of nomenclature which describes the stages of ovarian ageing.

Nomenclature:- Stages of Reproductive Aging Workshop(STRAW+10)

perimenopause persistent differences in cycle length of seven or more days between consecutive cycles (Stage -2)

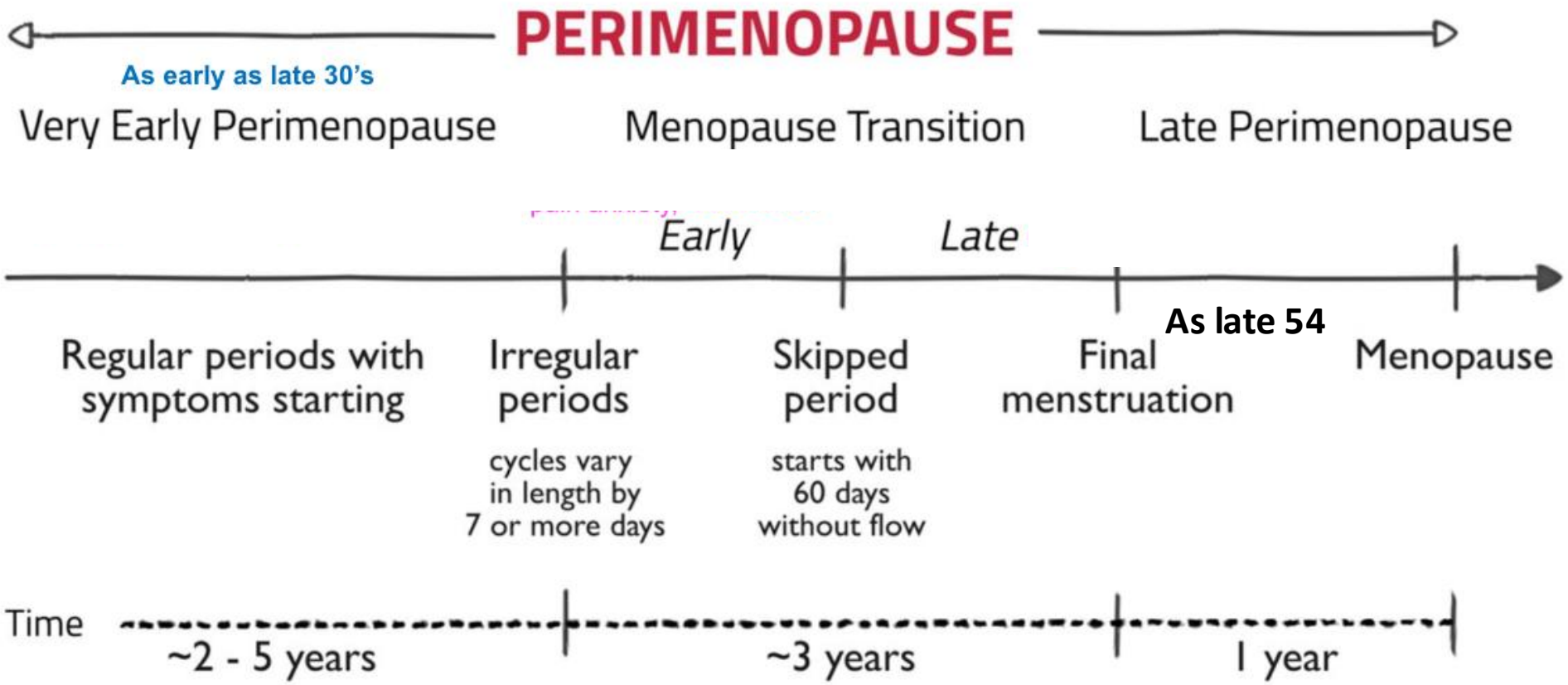
	First Period						Final Menstrual Period				
Stage	-5	-4	-3b	-3a	-2	-1	0 / +1a	+1b	+1c	+2	
Terminology	REPRODUCTIVE				MENOPAUSAL TRANSITION		POSTMENOPAUSE				
	Early	Peak	Late		Early	Late	Early			Late	
					Perimenopause						
Duration	*Variable*				*Variable*	1-3 years	2 years (1+1)		3-6 years	*Remaining lifespan*	
PRINCIPAL CRITERIA											
Menstrual Cycle	Variable to regular	Regular	Regular	Subtle changes in Flow/ Length	*Variable Length* Persistent ≥7- day difference in length of consecutive cycles	Interval of amenorrhea of >=60 days					
SUPPORTIVE CRITERIA											
Endocrine FSH AMH Inhibin B			Low Low	Variable Low Low	↑ Variable Low Low	↑ >25 IU/L Low Low	↑ Variable Low Low		Stabilizers Very Low Very Low		
Antral Follicle Count			Low	Low	Low	Low	Very Low		Very Low		
DESCRIPTIVE CHARACTERISTICS											
Symptoms						Vasomotor Symptoms *Likely*	Vasomotor Symptoms *Most Likely*			Increasing symptoms of urogenital atrophy	

Source: Harlow, S. D., Gass, M., Hall, J. E., Lobo, R., Maki, P., Rebar, R. W., Sherman, S., Sluss, P. M., de Villiers, T. J., & STRAW+10 Collaborative Group (2012). Executive summary of the Stages of Reproductive Aging Workshop +10: addressing the unfinished agenda of staging reproductive aging. Climacteric : the journal of the International Menopause Society, 15(2), 105–114.

Menopause 12 months after the last menstrual period (stage +1a)

Naming Women's Midlife

JERILYNN C. PRIOR, UBC PROF. ENDOCRINOLOGY, UBC-CEMCOR



"I feel weird"| anxious| breast pain | **periods no change**

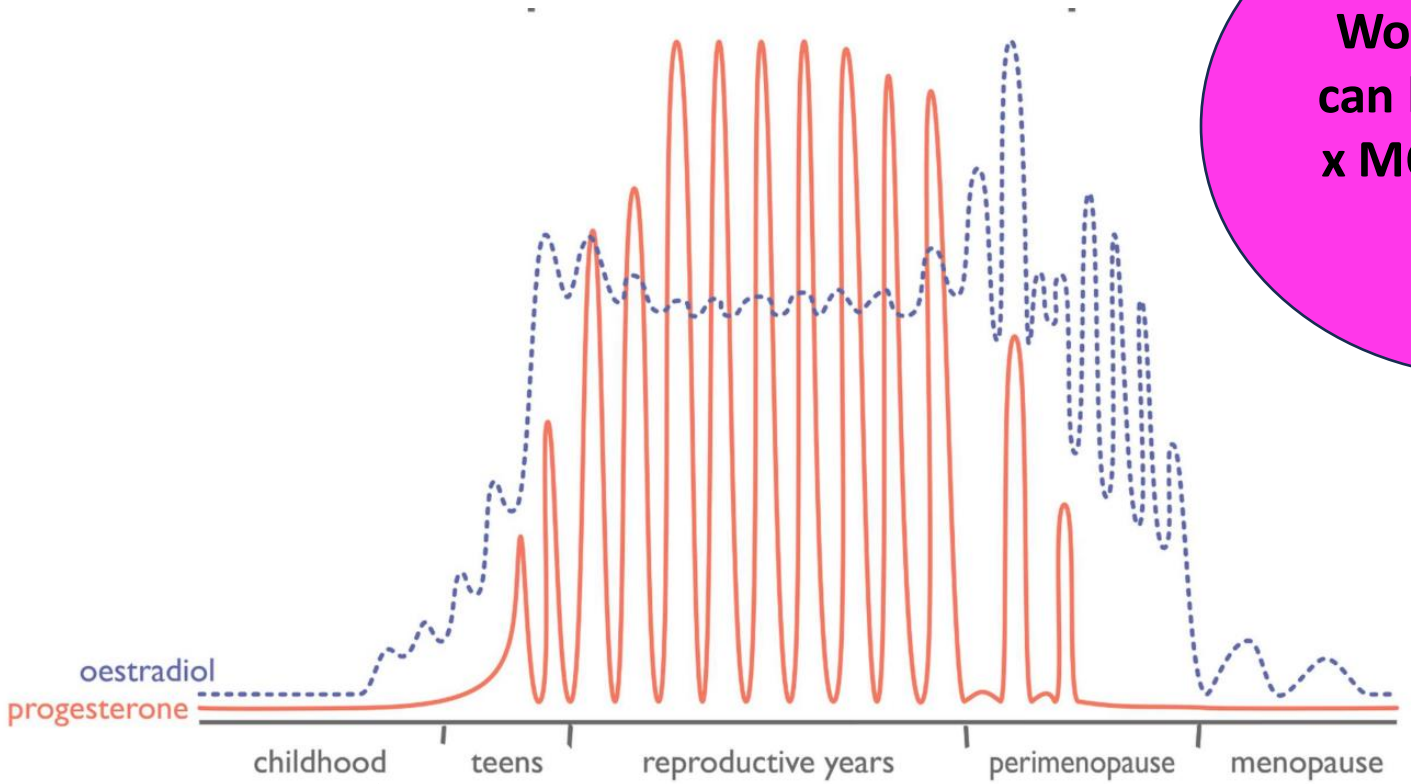
Cycles start to change
Unopposed E2 symptoms ; neurological changes (mood, hot flushes) , sleep issues , heavy flooding, metabolic changes, bone loss.

"Women need to know that perimenopause ends in a kinder and calmer phase of life called menopause"

Dr Jerilynn C . Prior

Why? .....

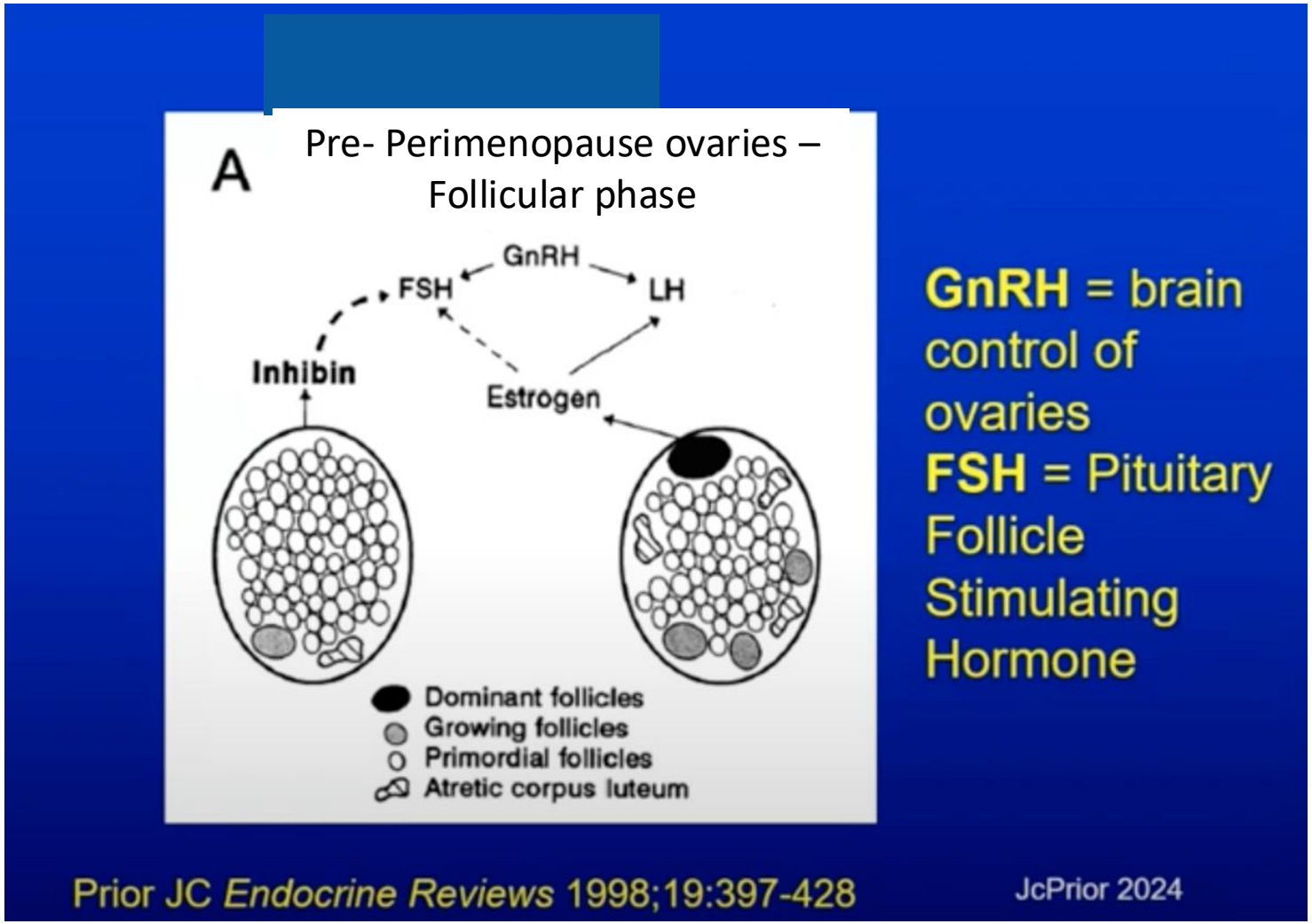
menopause transition
-Perimenopause-



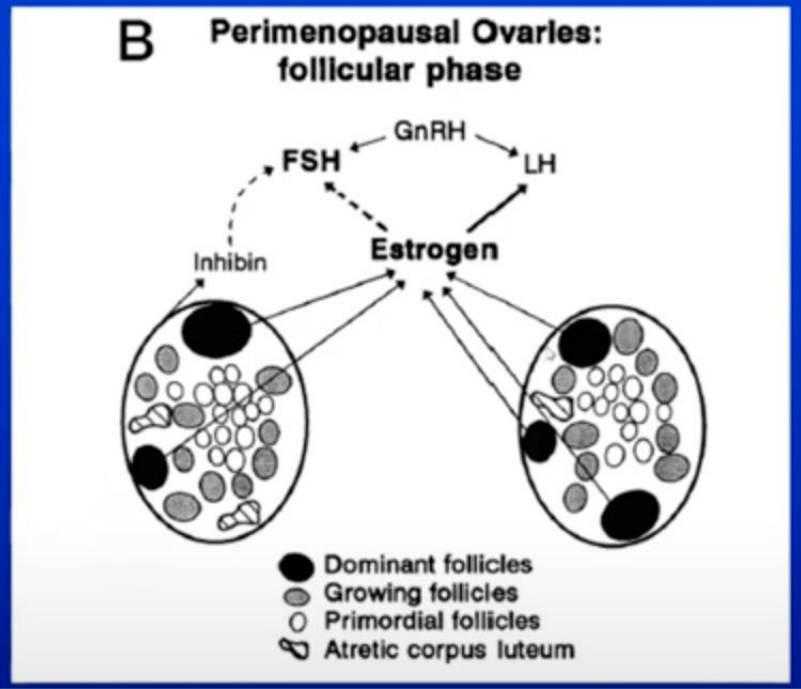
Women in 40's can have up to 3 x MORE E2 than in 30's

Building of metabolic reserve

-Perimenopause –



-Perimenopause –



Lower **Inhibin** allows the ovaries to get rid of un-needed follicles

Women in 40's can have up to 3 x MORE E2 than in 30's

Note

>The lower follicle number

>Much lower inhibin levels

Dominant folliices (plural) making more oestrogen – but not reliably suppressing FSH

Prior JC *Endocrine Reviews* 1998;19:397-428 JcPrior 2024

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Perimenopause – Unpredictable – No Definitive Test

Perimenopause is "diagnosed" by symptoms

3 of the following 9 changes

1. New – onset heavy and /or longer flow
2. Shorter menstrual cycles (<26 days)- *due to high FSH >> ovulating more rapidly)*
3. New sore, swollen or lumpy breasts
4. New mid-sleep waking
5. Increased menstrual cramps
6. Onset of night sweats
7. New or increased migraine headaches
8. New or increased PMS mood swings
9. Weight gain without changes in diet

PLUS other conditions being ruled out

These symptoms result from

Higher E2
(In some activation mast cells)
&
Lower

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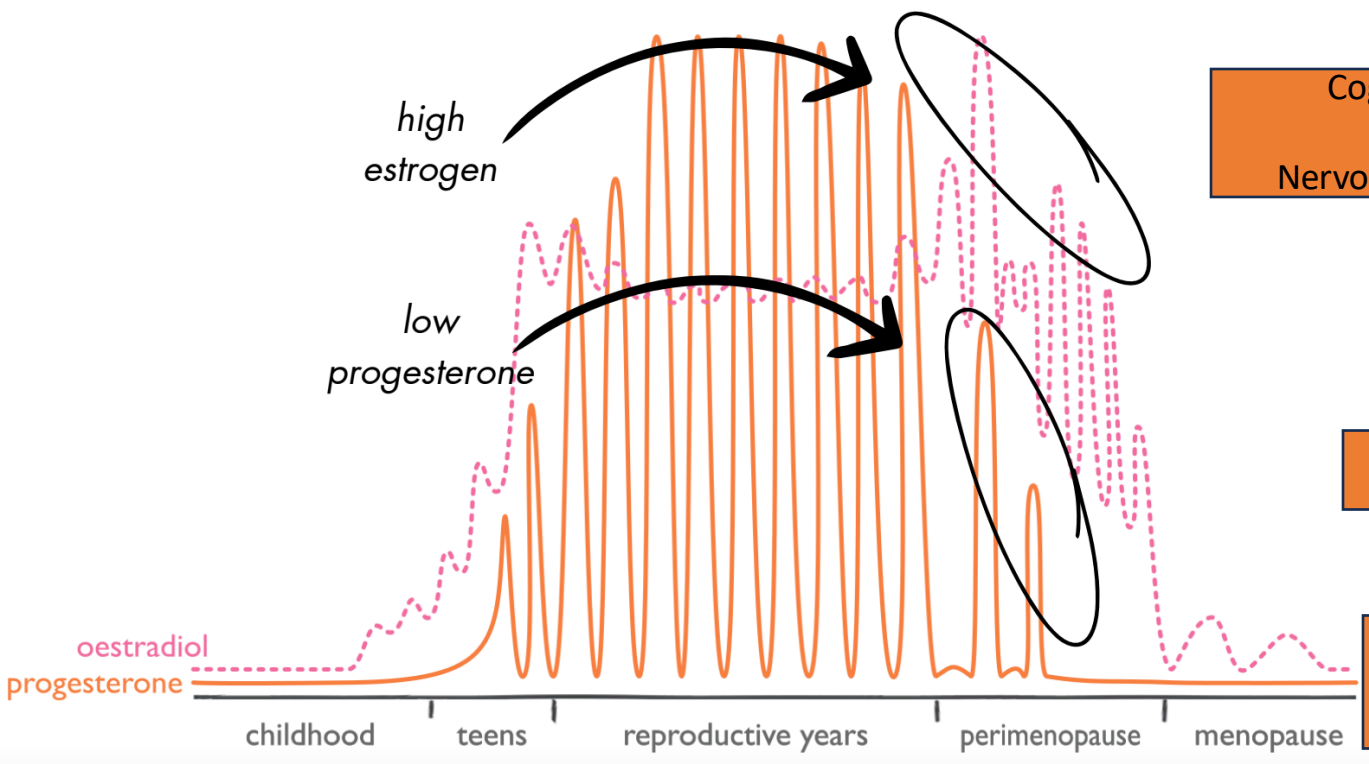
Perimenopause **can** be a tipping point

"Window of Oppourtunity" SWAN



Cognitive
&
Nervous System

Metabolic

Immune
& Inflammatory

Midlife Aging
40 - 65 Years Old

The Menopause Transition
- Heterogeneous patterns of E2 decline and FSH rise
- Menstrual cycle irregularity
- Between-woman heterogeneity is related to factors such as race/ethnicity

Changes in Symptoms and Mental Health

- ↑ Depression and Anxiety — *Transient*
- ↑ Urinary Incontinence
- ↓ Cognitive Performance (After Menopause)
- ↑ Vasomotor Symptoms (Hot Flashes and Night Sweats) — *Transient*
- ↑ Sleep Complaints
- ↑ Cognitive Difficulties — *Transient*
- ↑ Vaginal Dryness
- ↑ Sexual Pain ↓ Sexual Desire

Changes in Physiological Systems and Functions

- ↓ Physical Function Performance — *Transient*
- ↑ Lipids ↑ Vascular Remodeling ↑ Metabolic Syndrome
- ↑ Body Mass Index ↑ Blood Pressure
- ↓ Bone Mineral Density
- ↓ Lean Mass ↑ Fat Mass

Window of Opportunity

+ Awareness
Adopt health behaviors
Design early preventive practices

Swan
The Study of Women's Health Across the Nation

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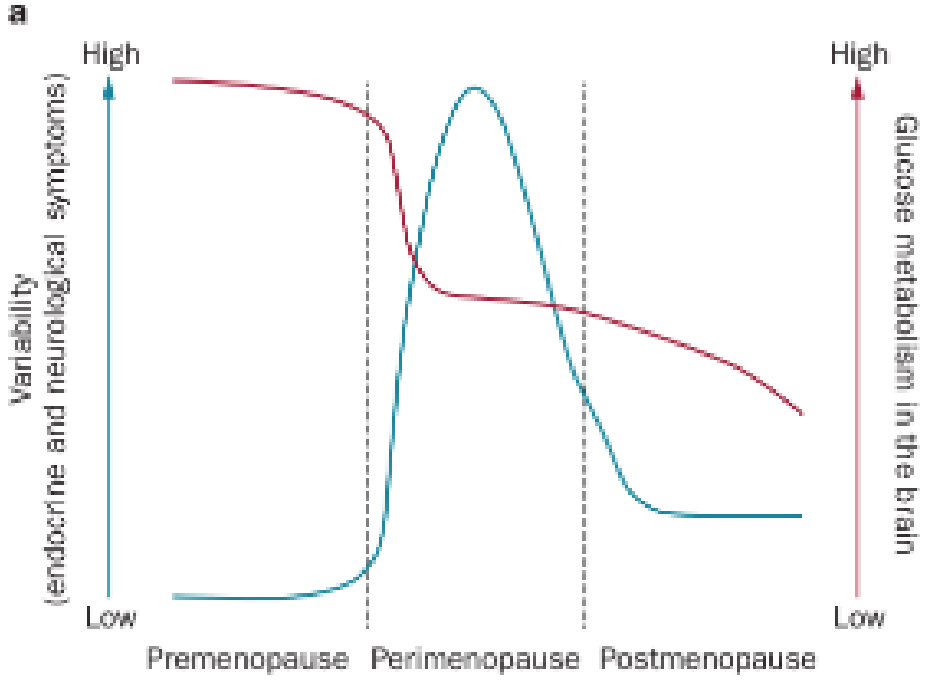
Rewiring the brain- Impact Fluctuating Oestrogen



Mosconi, L et al. Sci Rep. 2021 Jun 9;11(1):10867. PMID: 34108509

scientific reports

Check for updates

OPEN

Menopause impacts human brain structure, connectivity, energy metabolism, and amyloid-beta deposition

Lisa Mosconi[1,2,3✉], Valentina Berti[4], Jonathan Dyke, Lacey Loughlin[1], Grace Jang[1], Aneela Rahman[1], Ho, Randolph Andrews[5], Dawn Matthews[5], Orli Etingin, Richard Isaacson[1] & Roberta Diaz Brinton[6]

All women undergo the menopause transition (MT), a n... aging trajectories of multiple organ systems including b... characterized by clinically defined stages with specific n... of how this process impacts the human brain. This multi-modality neuroimaging study indicates

> "...oestrogen loss... triggers a decline in [glucose metabolism] prompting an adaptive reaction to increase ketone bodies utilization..."

BRAIN

The only organ dependent on ketones as an alternate fuel to glucose

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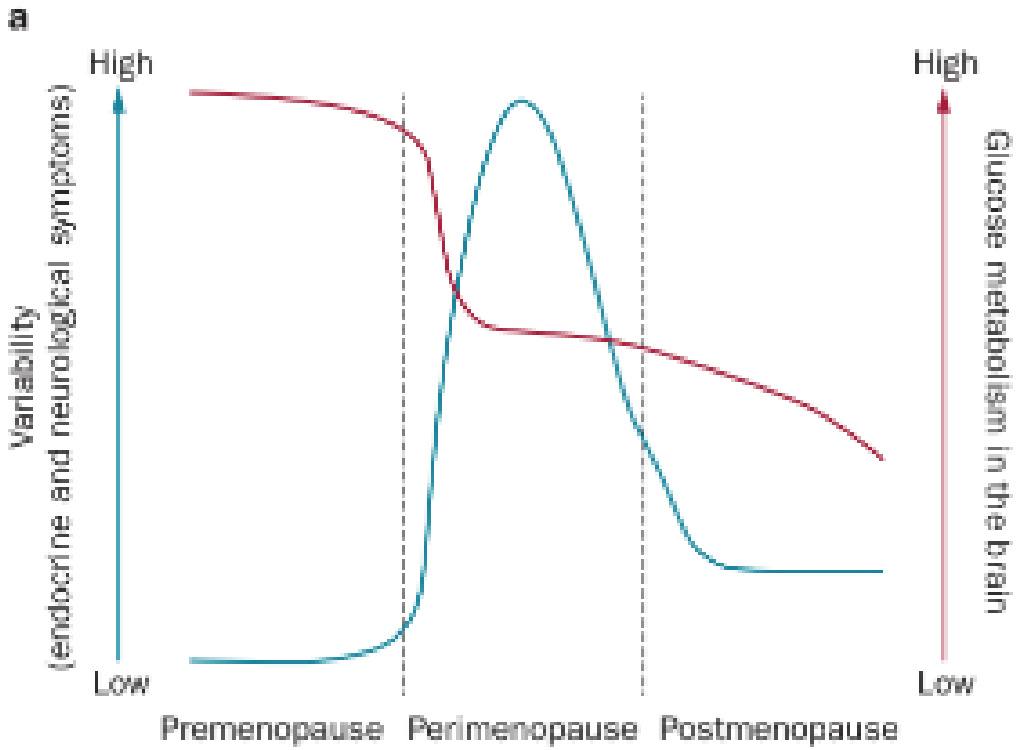

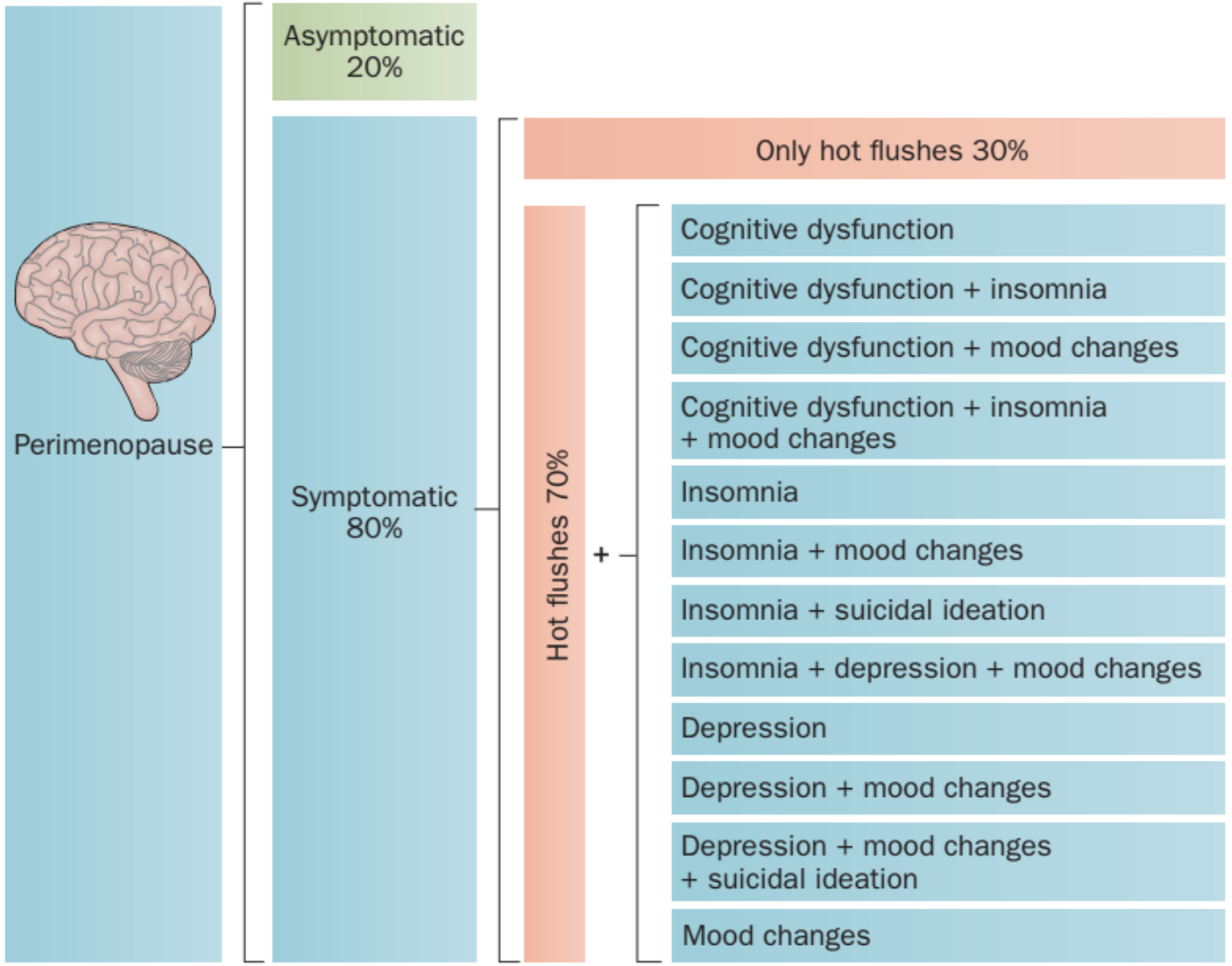

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Menopause Is Associated With Postprandial Metabolism, Metabolic Health and Lifestyle: The ZOE PREDICT Study

18 Pages • Posted: 11 Mar 2022

Kate Bermingham
King's College London - Department of Twin Rese

Inbar Linenberg
Zoe Global Limited

More...

"Menopause is a time of major metabolic upheaval."

Abstract

Background: The menopause transition is associated with unfavourable alterations in health. However, postprandial metabolic changes and their mediating factors are poorly understood.

Methods: The PREDICT 1 UK cohort (n=1002; pre- n=366, peri- n=55, and post-menopausal females n=206) assessed phenotypic characteristics, anthropometric, diet and gut mi
postprandial (0-6h) cardiometabolic blood measurements, including continuous glucose monitoring (CGM)

Bermingham et al., 2022. "Menopause is associated with postprandial metabolism, metabolic health." EBioMedicine.

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Cardiometabolic Effects Perimenopause

'EARLY' PERIMENOPAUSE

Hormones*

↔ E_2 *(relatively unchanged)*

↑ FSH *

CVD Risk Factors

↑ C-IMT and vascular remodeling

↓ Endothelial function (FMD)

NOTE: Few studies of women in *early perimenopause* have been conducted due to the inherent difficulty in categorizing women in this earlier stage. As a result, the cardiometabolic changes that occur during *early perimenopause* have yet to be fully elucidated.

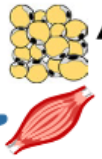
'LATE' PERIMENOPAUSE

Hormones*

↓ E_2 * and AMH

↑ FSH *

Body Composition



↑ Fat mass *(abdominal fat)*

↓ Fat-free (lean) mass

Energy Intake & Expenditure

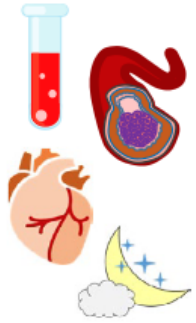
↓ 24-h, Sleep, & Physical Activity EE

↓ Resting EE (?)

↓ Fat oxidation

↓ Energy Intake

Cardiovascular Risk Factors



↑ Dyslipidemia *(mostly within 1-year of FMP)*

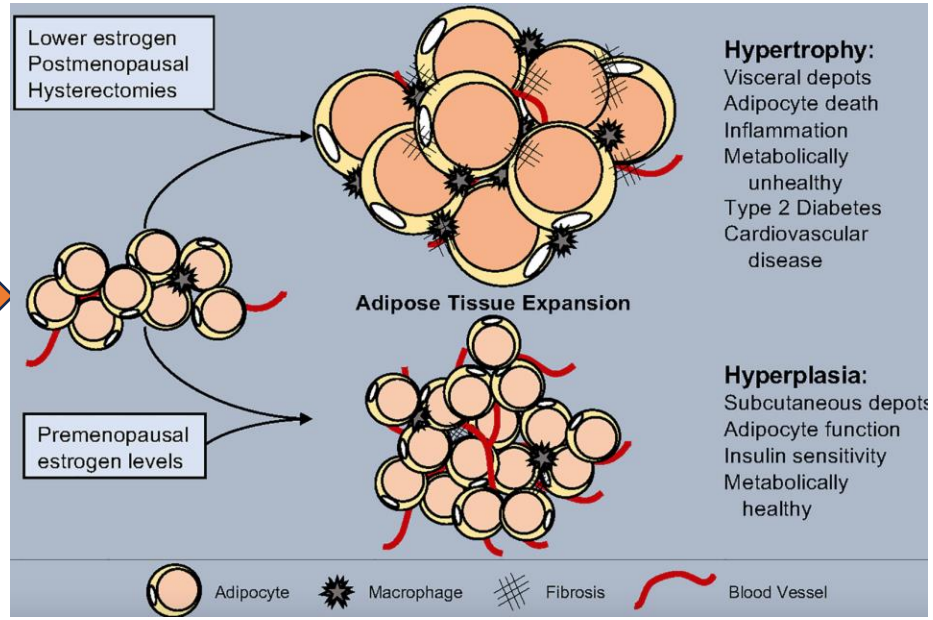
↑ C-IMT, Aortic PWV, and vascular remodeling

↓ Endothelial function (FMD) and cardiac health

↑ Insulin resistance

↑ Sleep disturbances

Adipocyte dysfunction



https://doi.org/10.3389/fendo.2022.889923

https://doi.org/10.3389/fendo.2022.889923

Subcutaneous fat

- Produces beneficial adipokines, leptin & adiponectin.
- Generally anti-inflammatory, especially gynoid fat.

Hypertrophied visceral fat

- Produces resistin and is associated with leptin resistance.
- Highly inflammatory.

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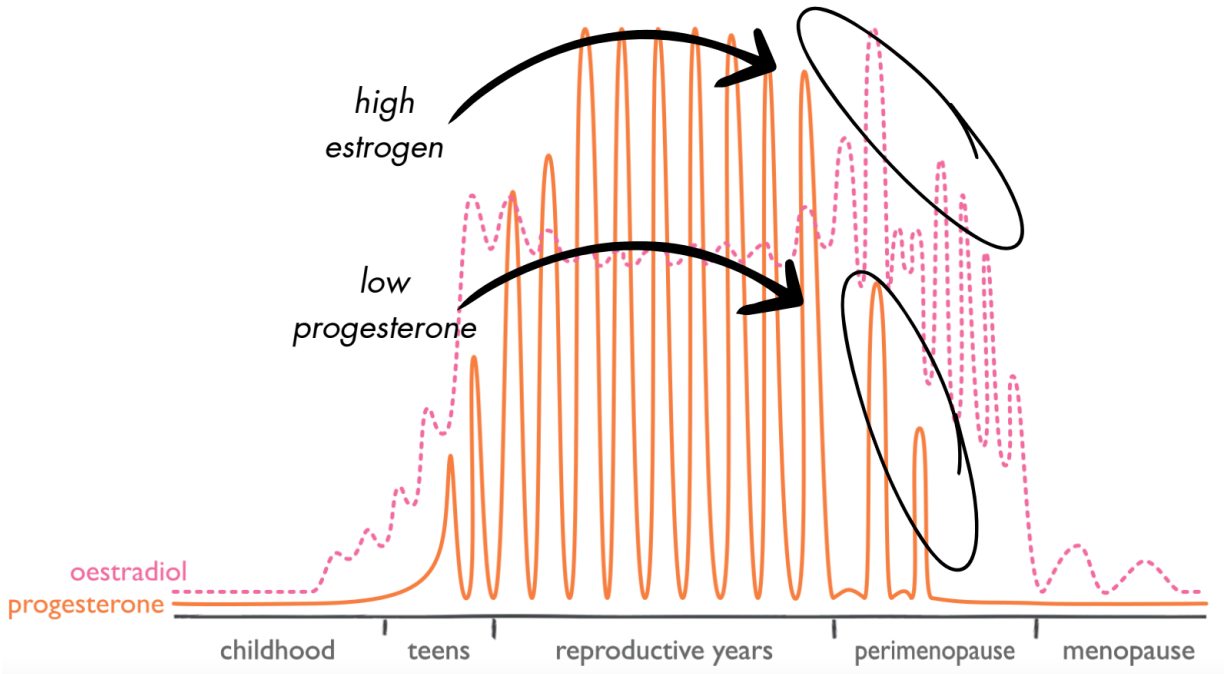
Perimenopause Nervous System Vulnerability



INTERNATIONAL REVIEW OF PSYCHIATRY, 2017
VOL. 29, NO. 6, 580–596
https://doi.org/10.1080/09540261.2017.1397607

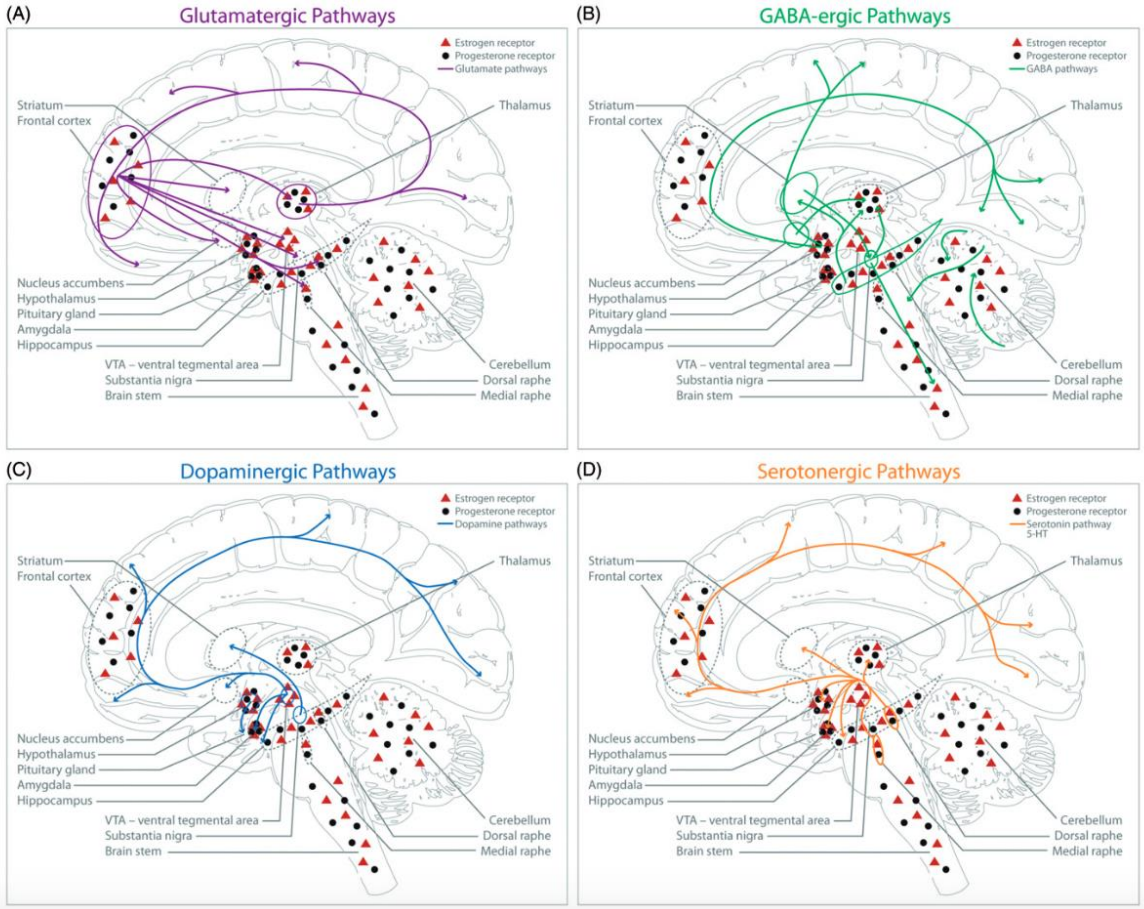
Taylor & Francis
Taylor & Francis Group

REVIEW ARTICLE

OPEN ACCESS Check for updates

Using positron emission tomography to investigate hormone-mediated neurochemical changes across the female lifespan: implications for depression

Rachel G. Zsido[a,b], Arno Villringer[b,c] and Julia Sacher[a,b,c]



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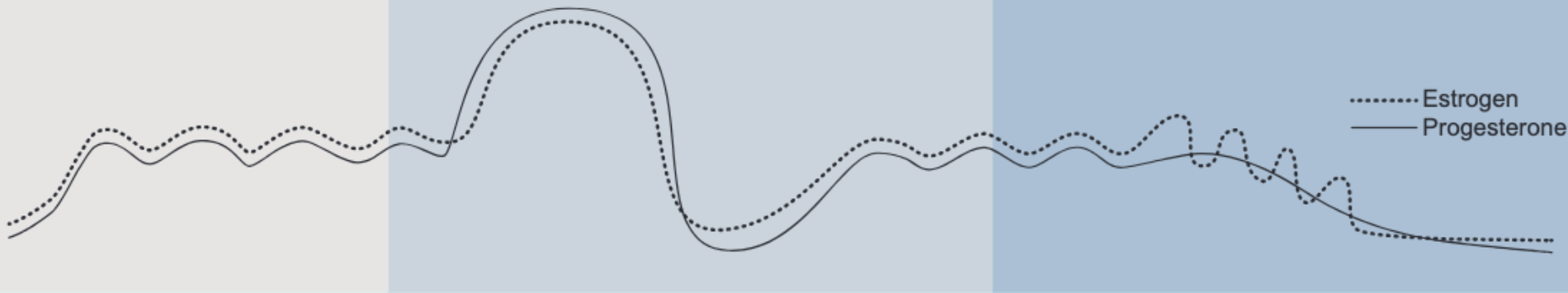
Hormonal Transition Periods and Mood Disorder Findings in PET in the Reproductive Years

	Puberty	Pregnancy / Post-Partum	Perimenopause
Hormones			
Depression	Premenstrual syndrome (PMS) Premenstrual dysphoric disorder (PMDD)	Post-partum depression (PPD)	Perimenopausal depression
PET Findings	***Jovanovic et al., 2006:*** 5-HT1A BP changed in the raphe nuclei from the follicular to the luteal phase of the menstrual cycle in HCs, but observed change was significantly smaller in PMDD ***Eriksson et al., 2006:*** Inverse relationship of negative mood symptoms and positive relationship of positive mood symptoms serotonin precursor trapping in PMDD	***Moses-Kolko et al., 2008:*** reduced 5HT1A receptor postsynaptic BP in the ACC, mesiotemporal, and lateral orbitofrontal cortices in PPD women compared to HCs ***Moses-Kolko et al., 2006, 2012:*** reduced D2 and D3 receptor BP in ventral striatum in postpartum compared to non post-partum ***Sacher et al., 2010:*** elevated MAO-A levels throughout the brain[A] in post-partum blues compared to HCs ***Sacher et al., 2015:*** post-partum crying associated with greater MAO-A levels in the PFC and ACC	***Rekkas et al., 2014:*** elevated MAO-A levels in the brain[B] of perimenopausal age compared to both reproductive age and menopause, tendency to cry correlated with MAO-A levels in the PFC

Contents lists available at ScienceDirect

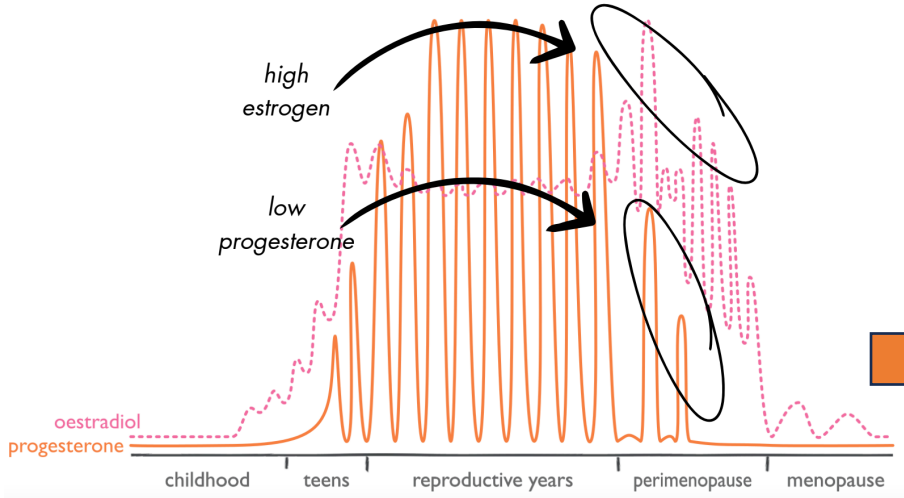
Maturitas

journal homepage: www.elsevier.com/locate/maturitas

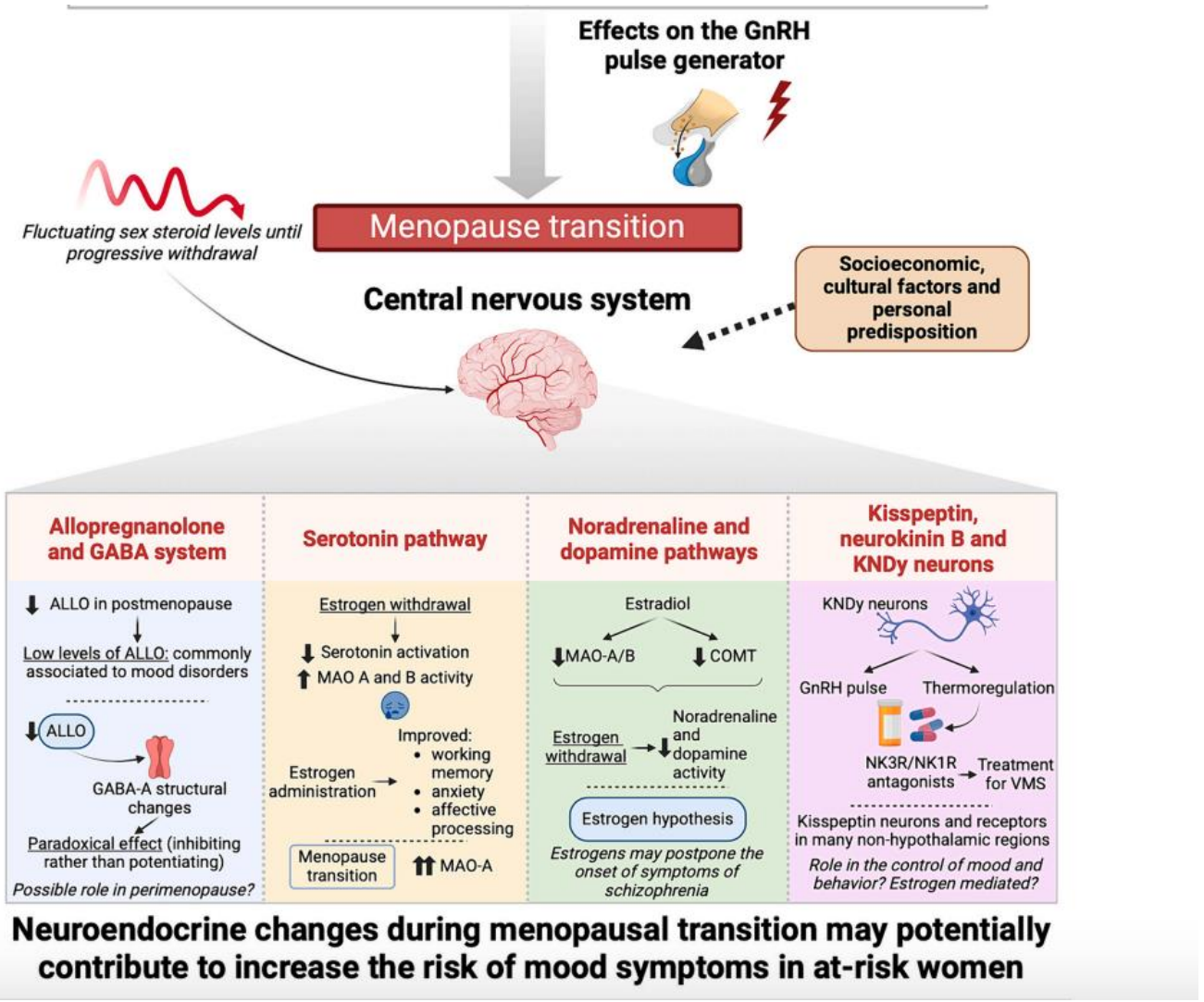
Review article

Neuroendocrine mechanisms of mood disorders during menopause transition: A narrative review and future perspectives

Tiziana Fidecicchi [a], Andrea Giannini [a,*], Peter Chedraui [b], Stefano Luisi [a], Christian Battipaglia [c], Andrea R. Genazzani [a], Alessandro D. Genazzani [c], Tommaso Simoncini [a]



GABA



Neuroendocrine changes during menopausal transition may potentially contribute to increase the risk of mood symptoms in at-risk women

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Perimenopause Immune Dysregulation

frontiers in Endocrinology

REVIEW
published: 29 April 2019
doi: 10.3389/fendo.2019.00265

Autoimmune Disease in Women: Endocrine Transition and Risk Across the Lifespan

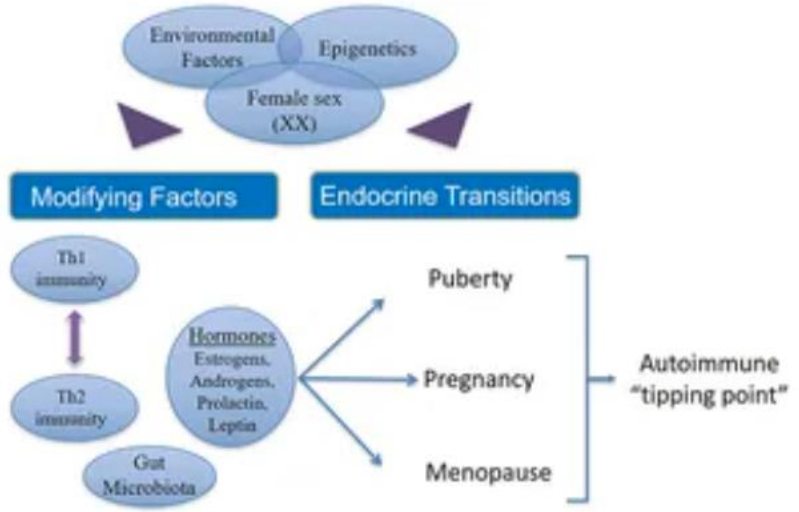
Maunil K. Desai[1] and Roberta Diaz Brinton[2]

[1] School of Pharmacy, University of Southern California, Los [illegible] Science, University of Arizona, Tucson, AZ, United States, [3] [illegible] Medicine, University of Arizona, Tucson, AZ, United States

Women have a higher incidence and preva[illegible] than men, and 85% or more patients of multiple autoim[illegible] diseases are female. Women undergo sweeping endocrinological changes at le[illegible] and menopause, with many women undergoing an additional transition: pregnancy, which

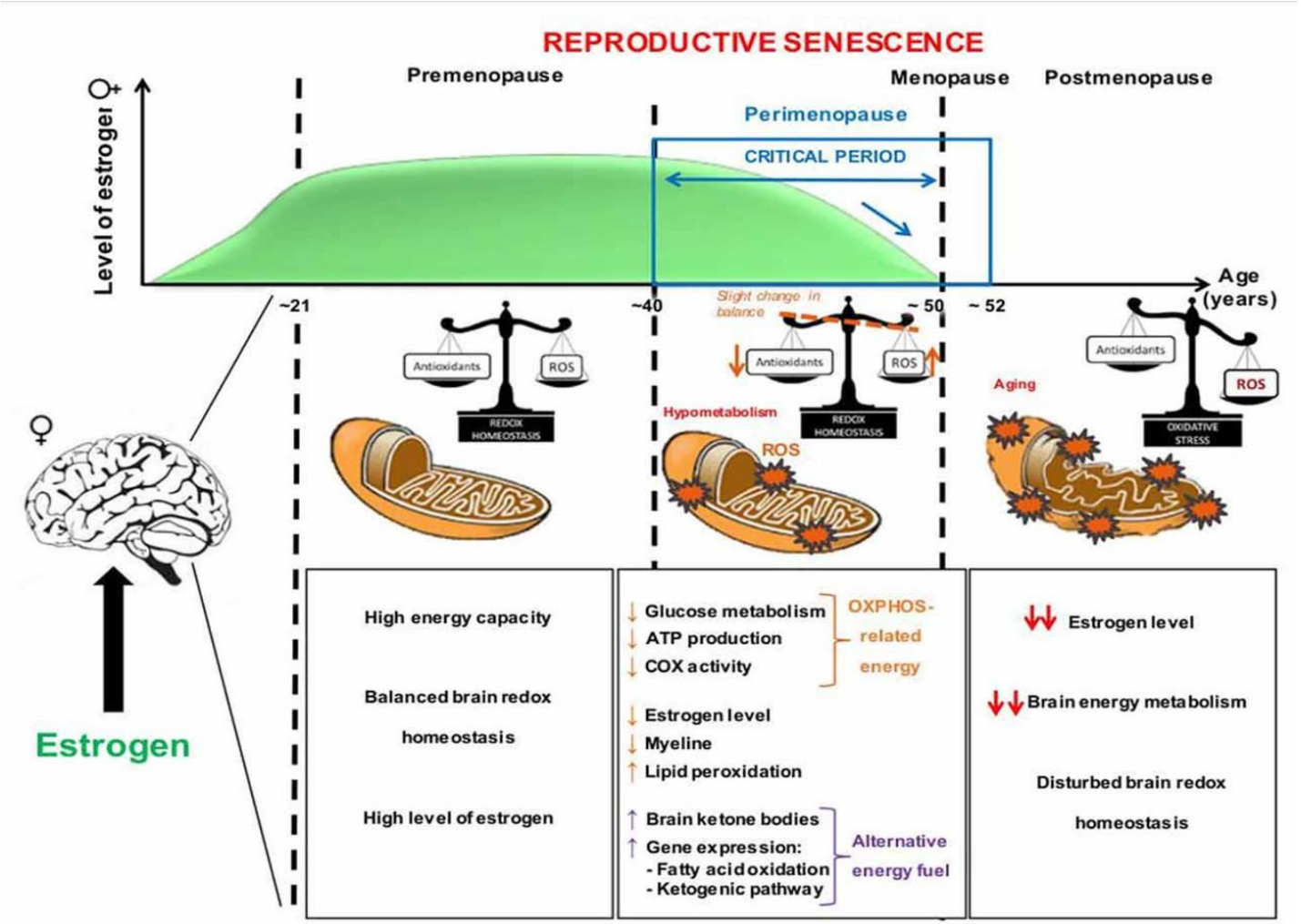
> "...hormonal flux in susceptible women may trigger downstream changes that disturb the fragile balance between inflammation and immune regulation."

Desai MK et al. Front Endocrinol. 2019; 10: 265. PMID: 31110493



"hormonal fluctuation, immune polarization and transition states together drive susceptible women over the autoimmune "tipping point" leading to manifestation of overt clinical disease."

Neuro-Immune-Cardiometabolic Vicious Cycle

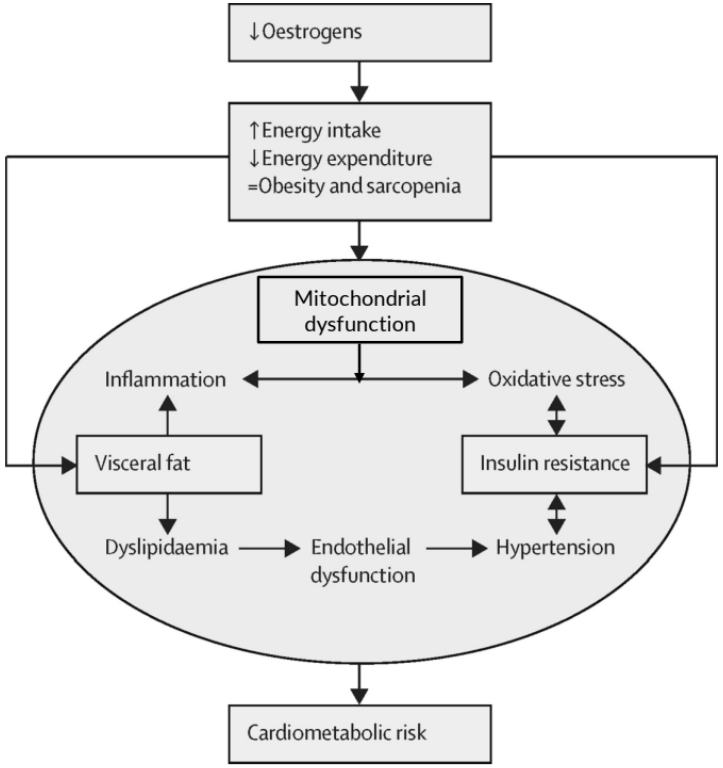


https://www.frontiersin.org/articles/10.3389/fnagi.2018.00124/full

Menopause: a cardiometabolic transition

Prof Rossella E Nappi, MD • Prof Peter Chedraui, MD • Prof Irene Lambrinoudaki, MD • Prof Tommaso Simoncini, MD

Published: May 05, 2022 • DOI: https://doi.org/10.1016/S2213-8587(22)00076-6 • Check for updates



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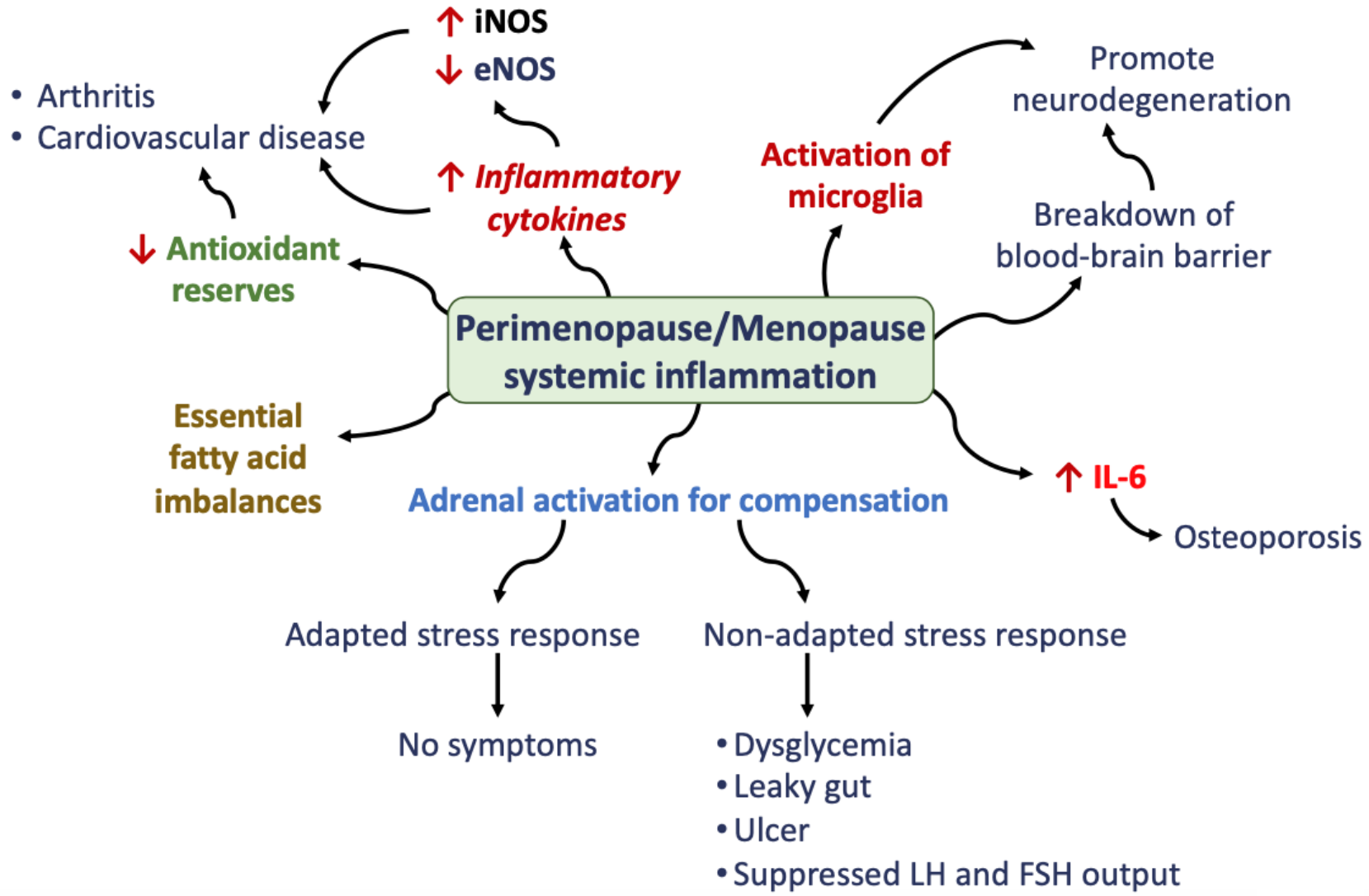
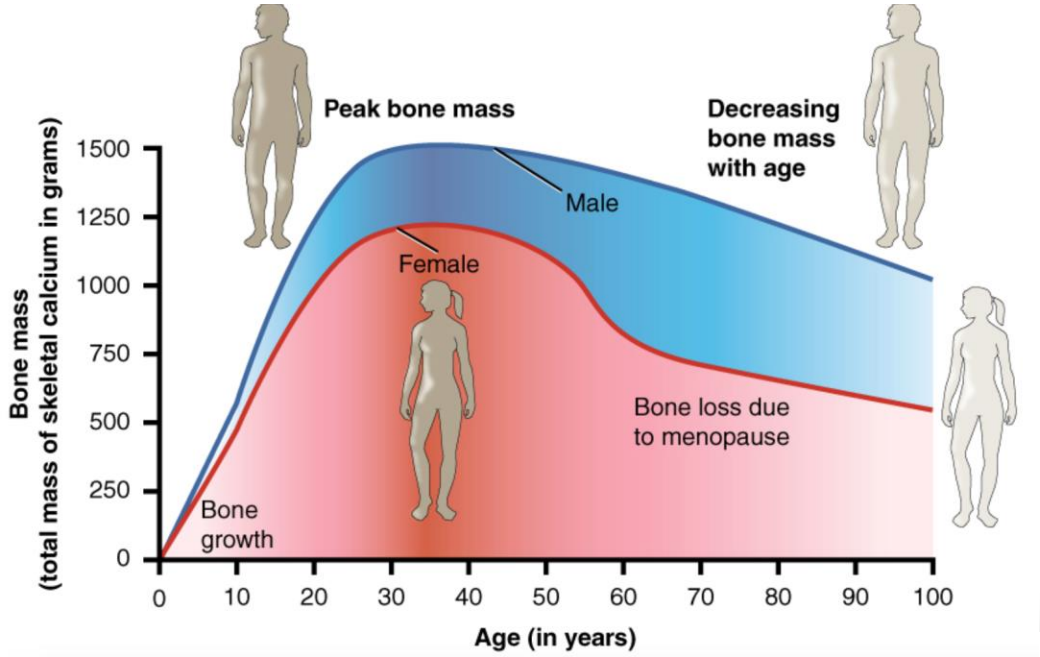
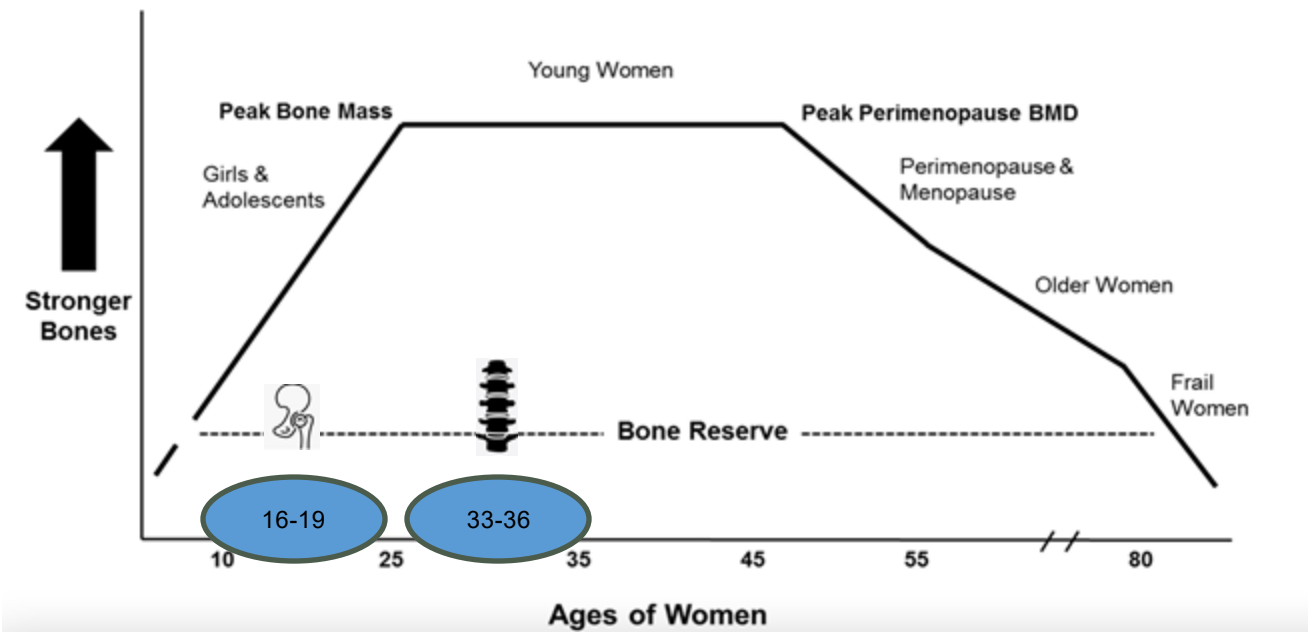
Impact Systemic Inflammation in Perimenopause



Peak Bone Mineral Density





Peak hip & femoral neck 16-19yrs
Lumbar spine 33 yrs

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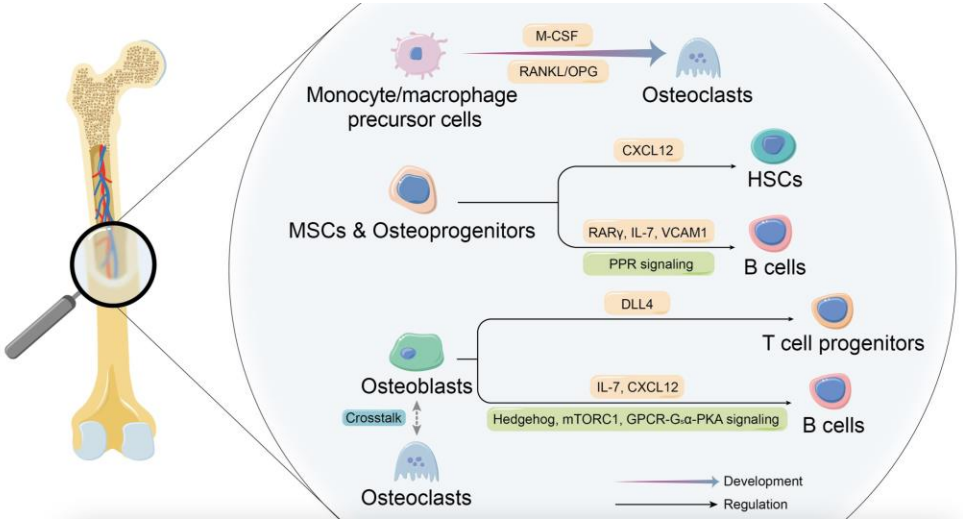
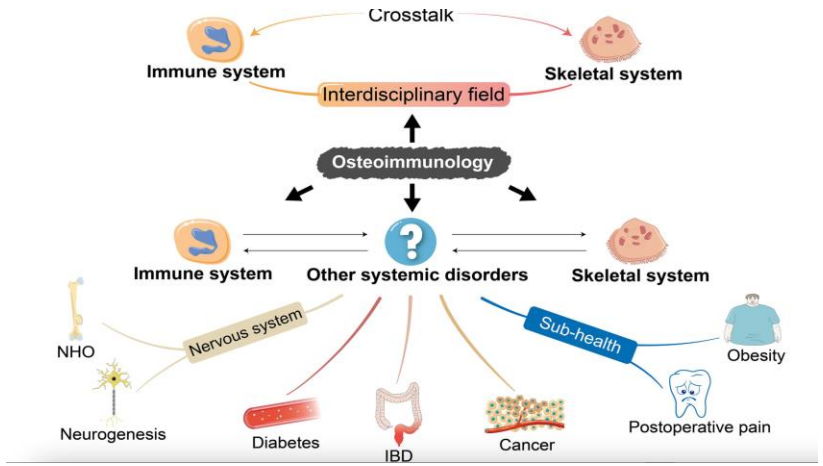
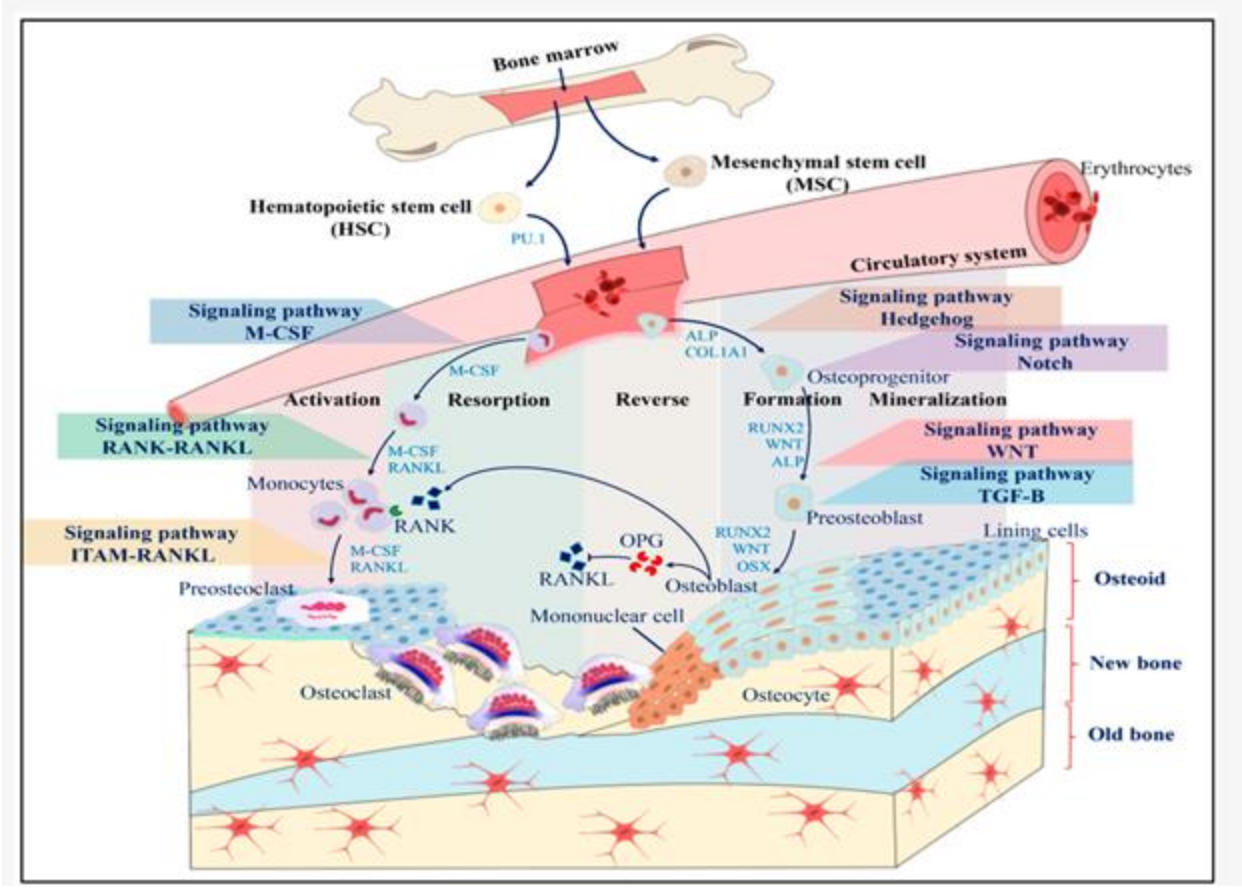
Osteoimmunology – speak the same language



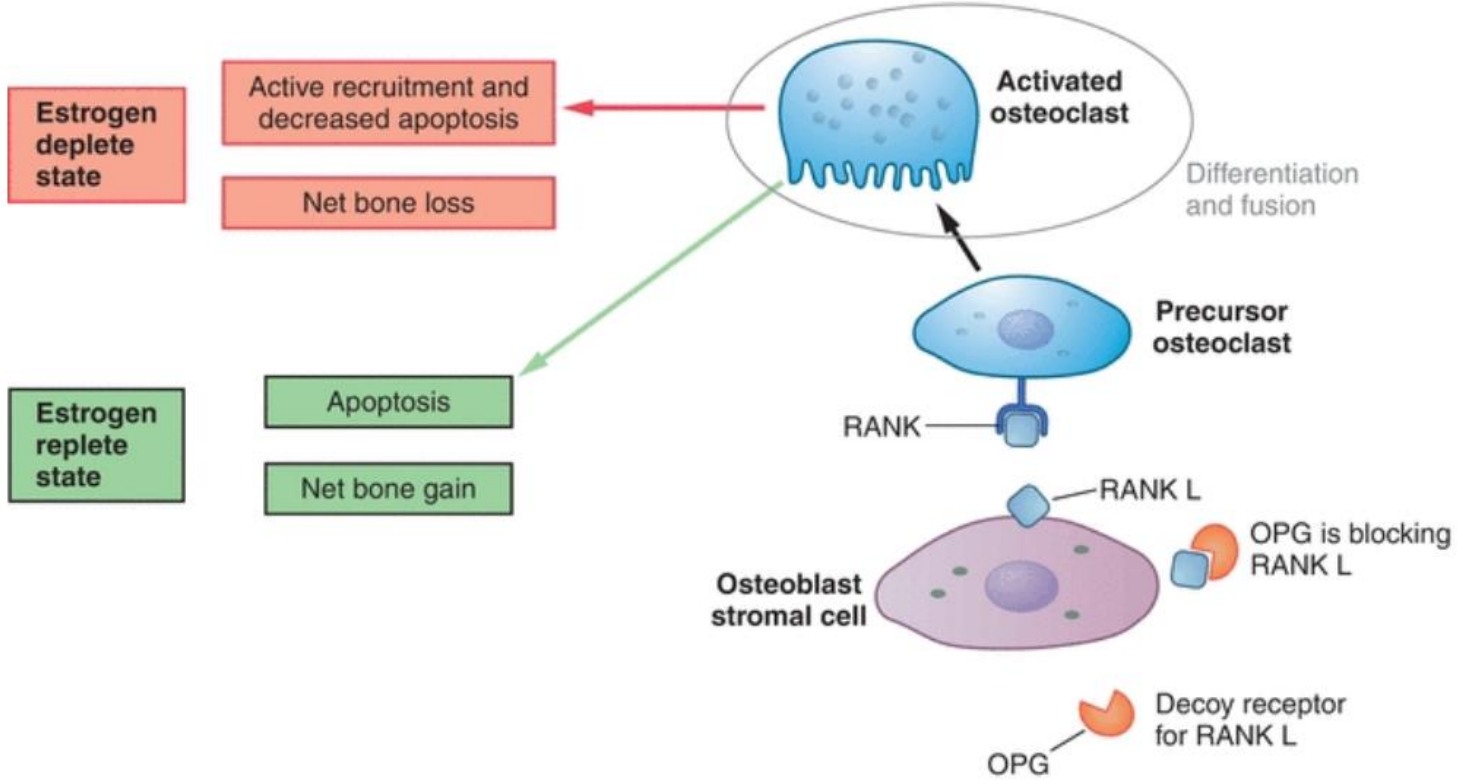




https://doi.org/10.3389/fcell.2021.698068

Perimenopause

E2 exerts a tonic suppression of remodeling by directing activated osteoclasts toward apoptosis; in the absence of E2, osteoclastic activity predominates, resulting in net bone resorption.



Window Oppourtunity Summary

Losing progesterone

- Lowered GABAergic tone
- Destabilization of HPA axis
- Anxiety, hot flushes , insomnia, migraines

High & Fluctuating E2

- *Immune* – dysregulation >> Autoimmune window
- *Nervous System* - Oestrogen withdrawal; cognition changes, memory loss, brain fog

hot flushes headaches , heavy periods & breast pain

- *Metabolism*- Insulin resistance > body shape change
- *Nervous System*- temporary 25% drop in brain energy
- Inflammatory – Bone density

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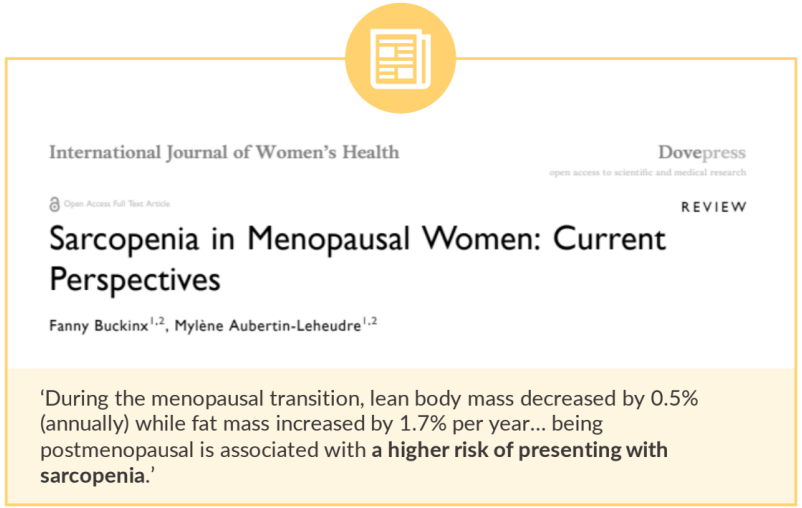
Perimenopause high-risk stage

Metabolic dysfunction & Insulin Resistance

Sarcopenic Obesity

Chronic Inflammation



International Journal of Women's Health

Dovepress

open access to scientific and medical research

Open Access Full Text Article

REVIEW

Sarcopenia in Menopausal Women: Current Perspectives

Fanny Buckinx[1,2], Mylène Aubertin-Leheudre[1,2]

'During the menopausal transition, lean body mass decreased by 0.5% (annually) while fat mass increased by 1.7% per year... being postmenopausal is associated with **a higher risk of presenting with sarcopenia**.'

Nutritional Therapy has a Tool Kit for all the above

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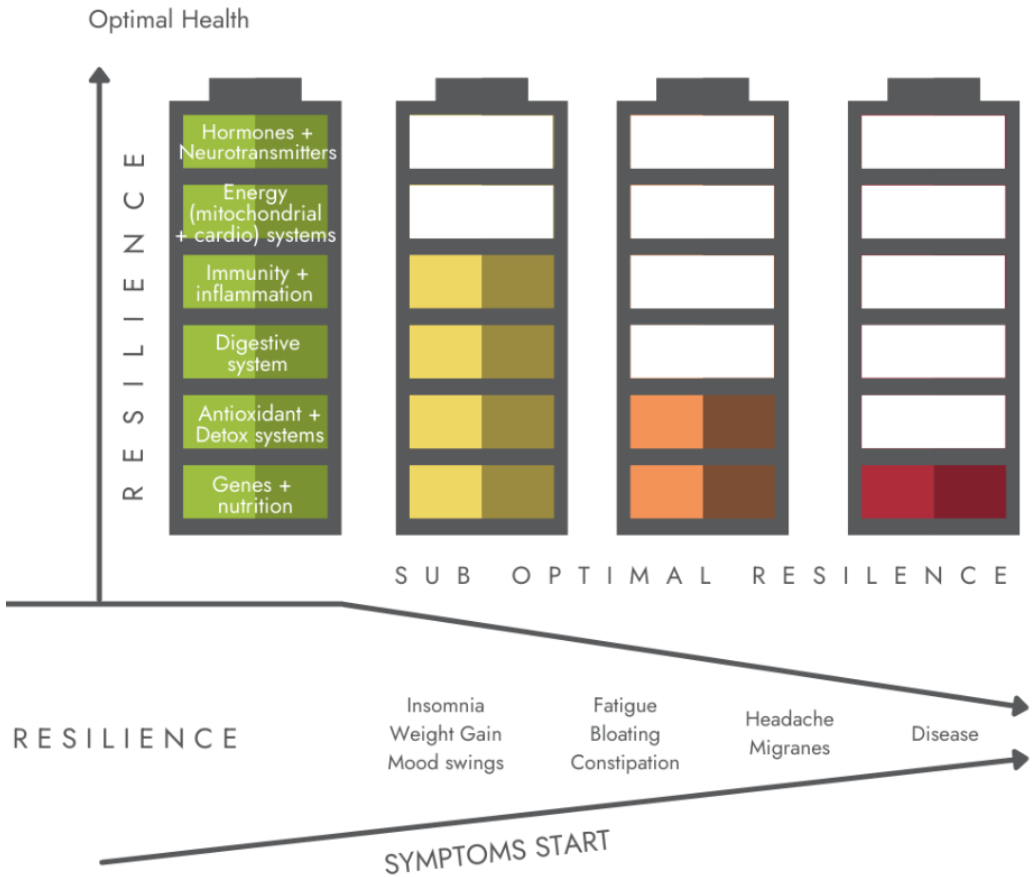
Metabolic Reserve



- Cell membrane integrity & receptor sensitivity
- Antioxidant Capacity
- Micronutrient reserves
- Mitochondrial capacity & health
- Digestive system and barriers
- Immune system
- Neuro-Endocrine systems
- Liver Detoxification
- Nutrigenomics

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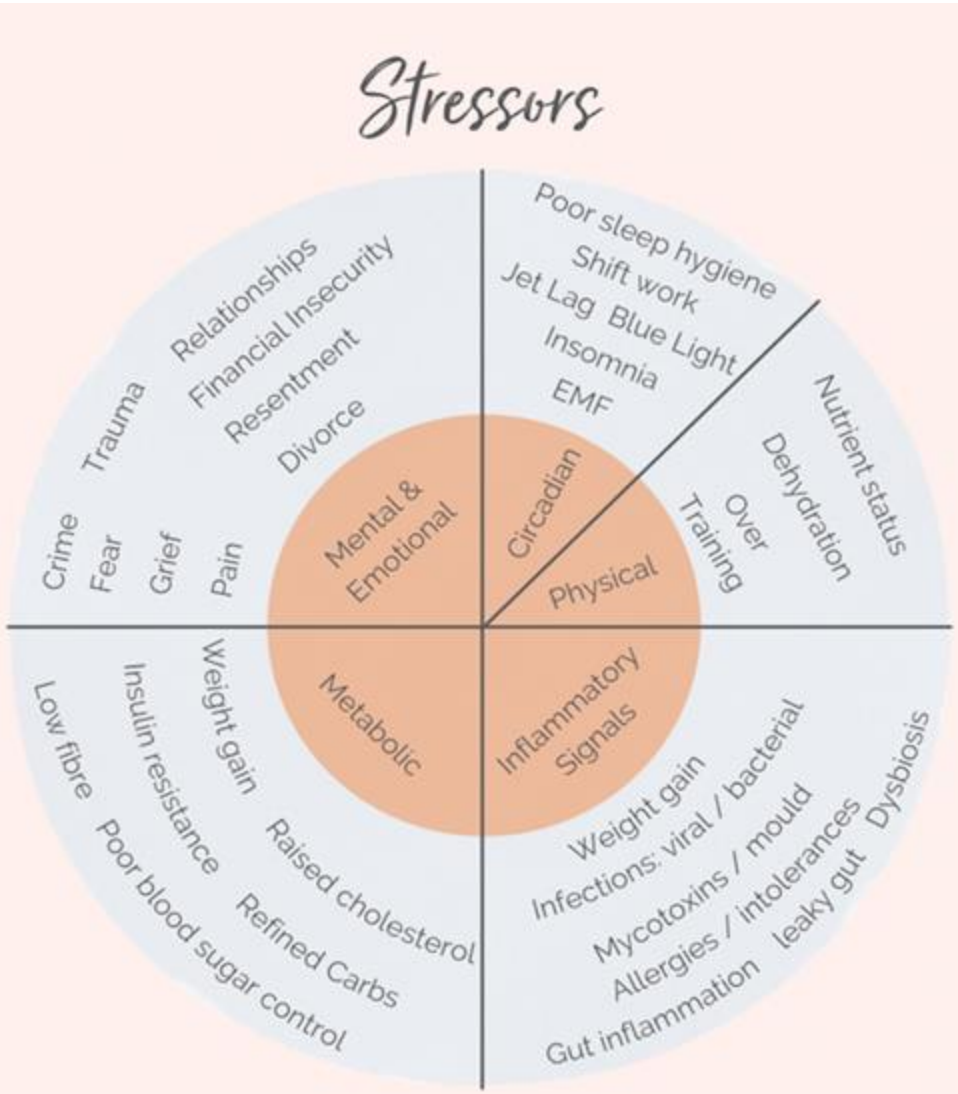
Stressors & Metabolic Reserve



Food ALWAYS first

- Mostly Plants(Complex carbs)
- Whole and natural vs CRAP

(colourless, refined & Processed)

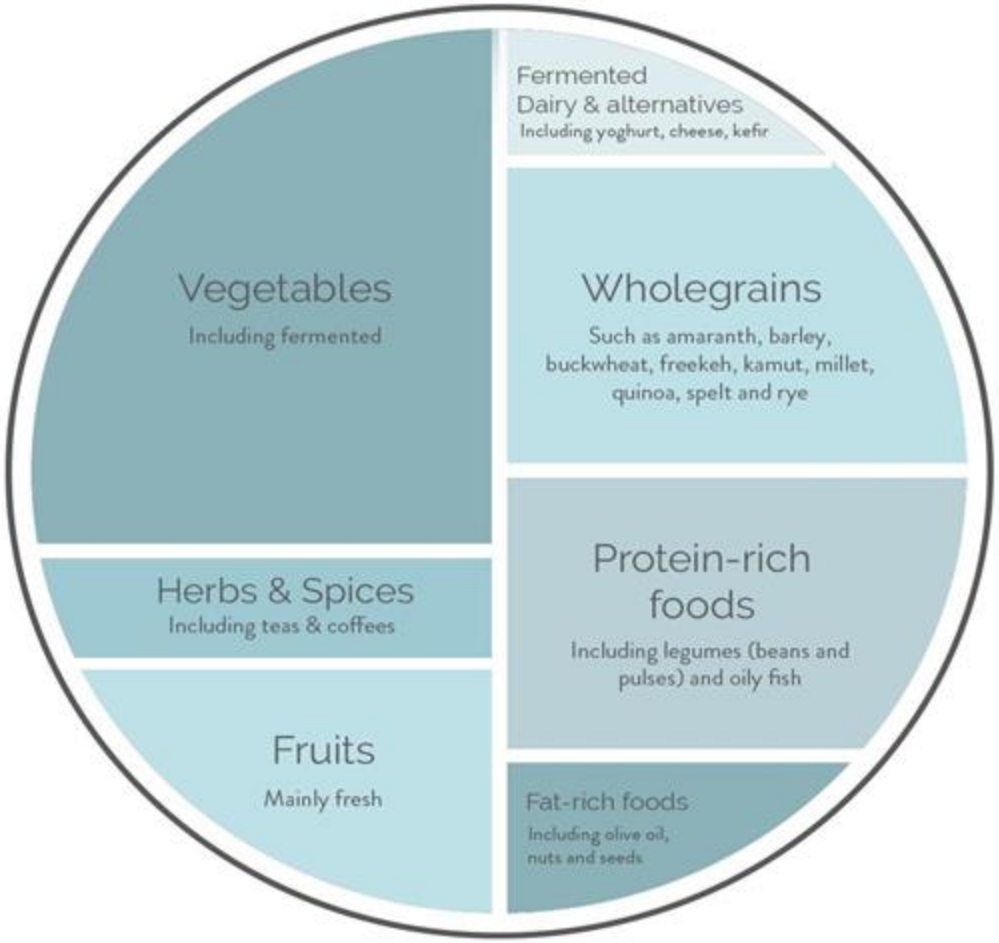
- Herb & Spice up your plate
- Protein

For perimenopause women 1.0 grams per kg of body weight p

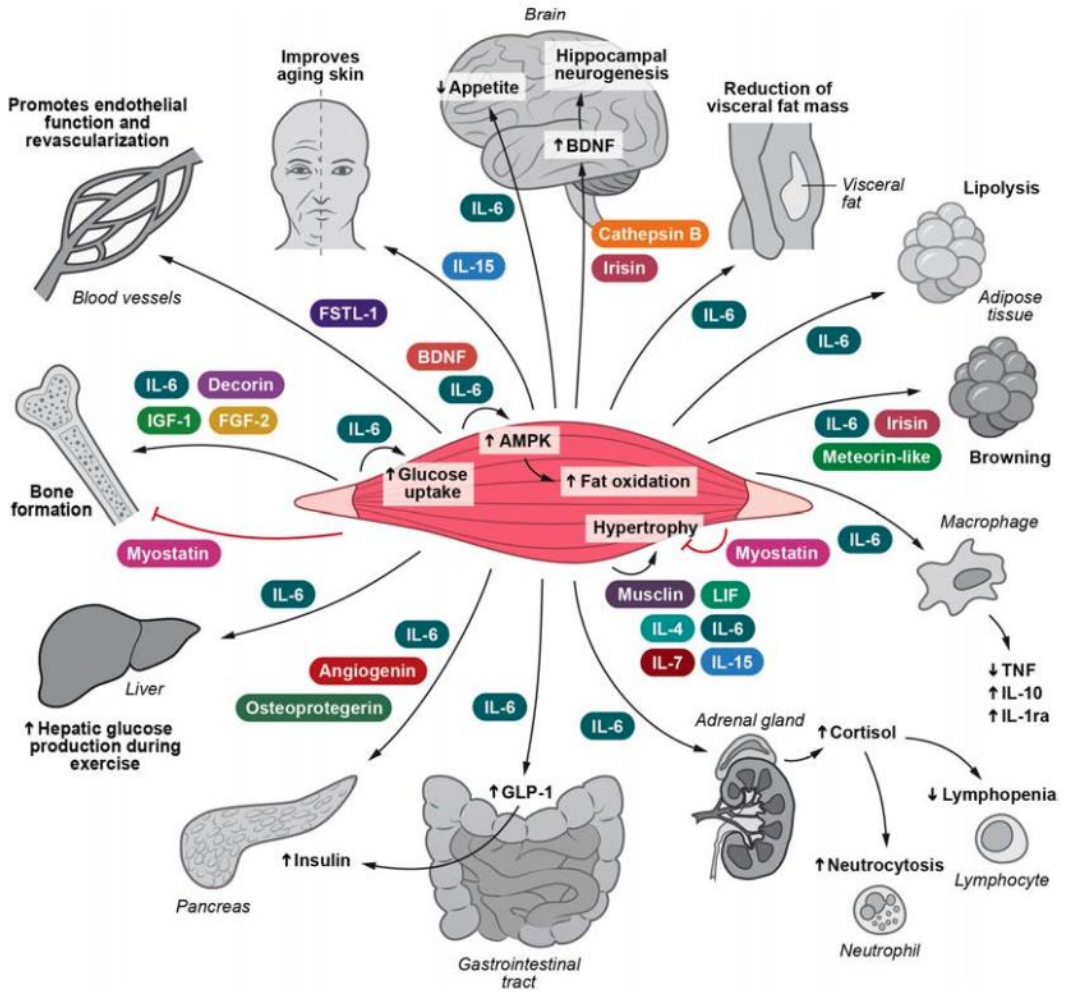
(bones and muscle)

- If "fasting" *BREAK*fast @ 9-10am =14-15 hr fast
- 800-1200g(osteo Dx) ***dietary*** calcium day
  - ❖ *Mineral* Water- 1- ½ litres (ca,k bones)
  - ❖ **Move** at least 30 mins every day!
- ENJOY- this is not a restrictive elimination DIET…..

Way of long, fulfilling healthy life



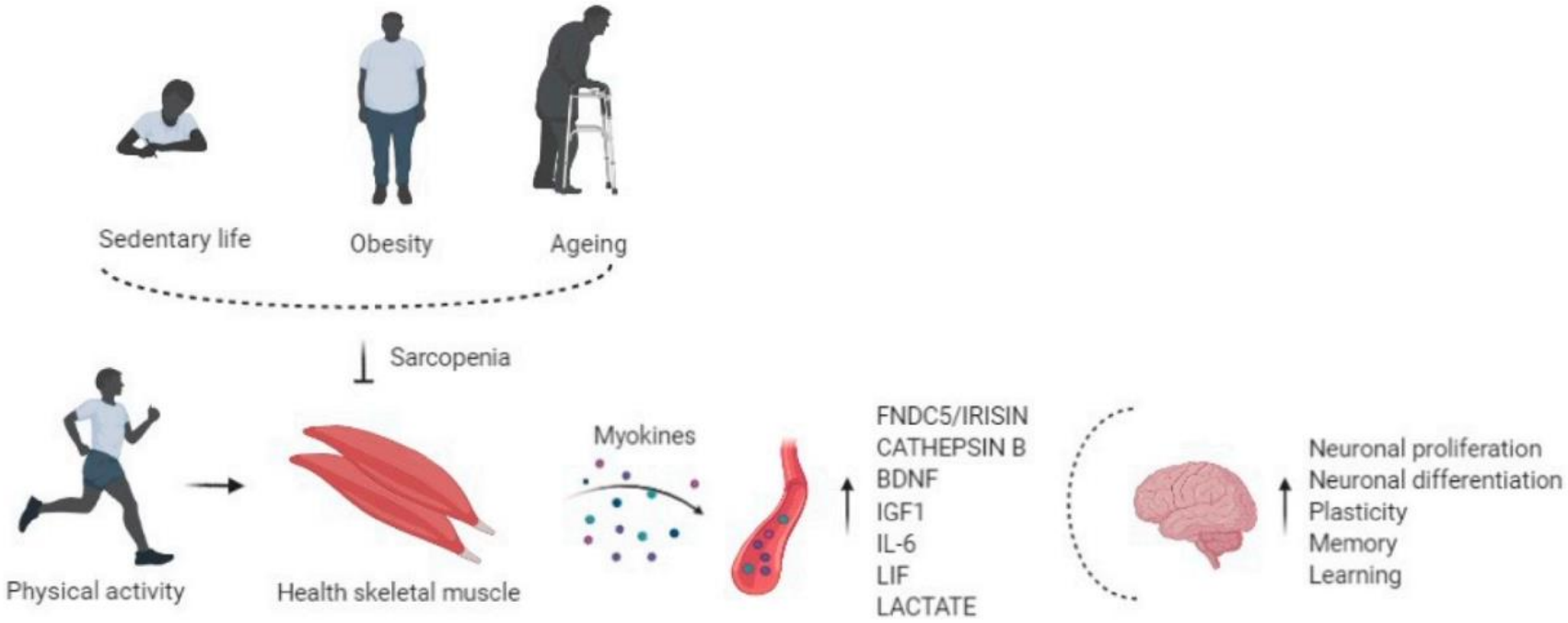
Movement :-Muscle Activation & Immuno-metabolic Modulation



Muscle-Organ Crosstalk: Focus on Immunometabolism

Immunometabolism.
Front. Physiol. 11:567881.

Muscle – Myokines –Brain Functionality



"Physical activity enhances circulating levels of myokines in the bloodstream, affects the brain regulating neuronal proliferation and differentiation, plasticity, memory, and learning."

Sarcopenia and Cognitive Function: Role of Myokines in Muscle Brain Cross-Talk

Life **2021**, *11*, 173. https://doi.org/10.3390/life11020173

Benefits Exercise

Progressive Weight Bearing

- AB crunch 3x 12-15
Leg curl 1 x 8-10 1 x 12-15
Leg press 1 x 8-12 1 x 12-20
Lateral raise 2 x 10-12 1 x 12-15
Single arm high row 1 x8-12
1x 12-15
Barbell row 1x 10 1 x 10-15

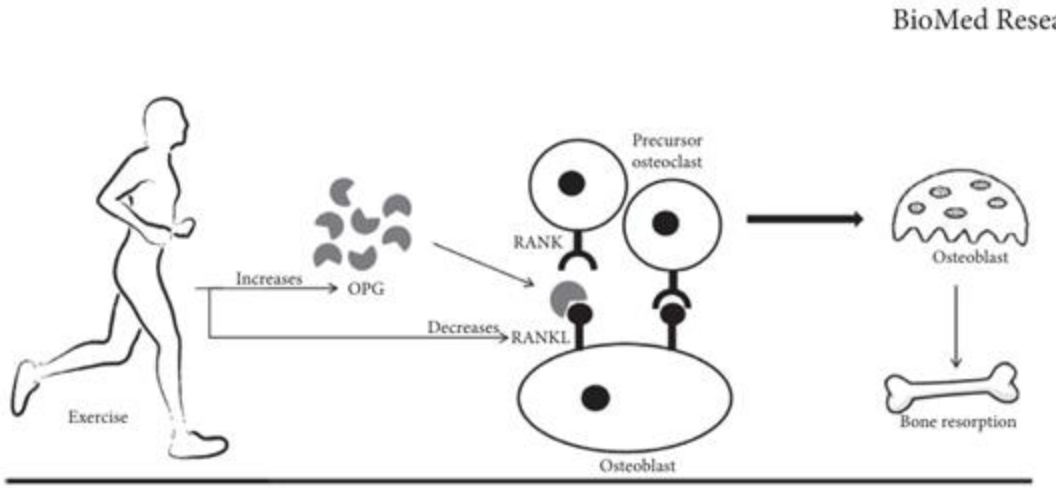


FIGURE 1: Interaction of exercise and RANKL/RANK/OPG biomolecular pathway. OPG: osteoprotegerin; RANK: receptor activator of nuclear factor κB; RANKL: receptor activator of NF-kB ligand.

Strength

Deadift 3 x 5-10
Lat pulldown 3 x 10-12
Lat raise 1 x 10-12
Bench press 3 x5
Leg curl 1 x 12-15
Squat 3 x 5

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Myo-inositol

Inositols in Midlife

Kalra, Sanjay; Kalra, Bharti[1]

Author Information

Journal of Mid-life Health 9(1):p 36-38, Jan–Mar 2018. | ***DOI:*** 10.4103/jmh.JMH_52_16

This review describes the mechanistic, animal, and clinical data related to the use of inositols in midlife. It covers studies related to the mechanism of action of myo-inositol and D-chiro-inositol and randomized controlled trials conducted in postmenopausal women with metabolic syndrome and supports these data with the results of *in vitro* and animal studies on inositol in nephropathy and other related conditions. Recent advances related to biochemistry, pharmaceutical science, and genetics are discussed. It concludes that inositols have a potential role to play in maintaining metabolic health in postmenopausal women.

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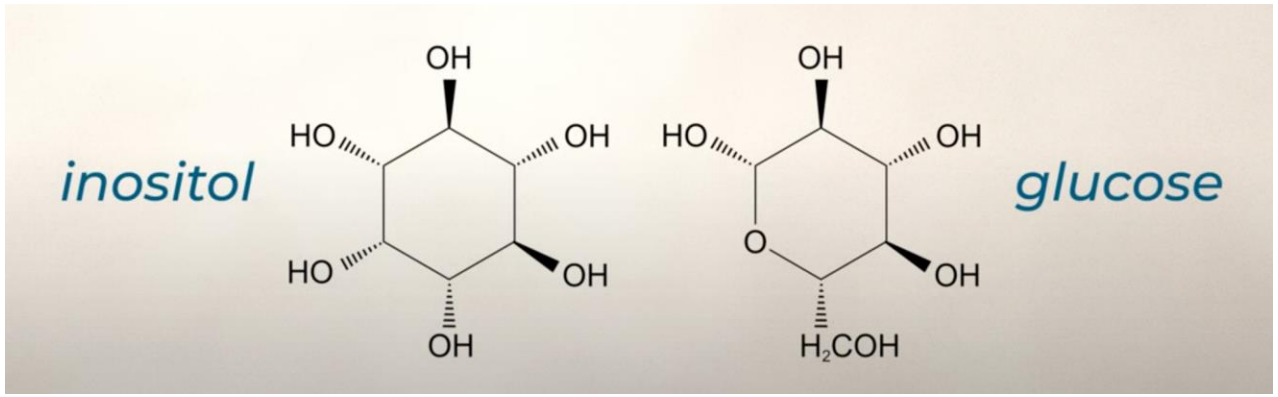
Myo-inositol

Inostiols are small molecules similar to sugar

- myo-inositol is the most abundant isomer makes up 95% in the body
- myo-inositol is an intracellular *2nd messenger* for hormones, especially insulin , FSH and TSH
- Being a 2nd messenger for insulin facilitates a normal response to insulin and thereby improving insulin sensitivity



Myo-inositol for insulin resistance, metabolic syndrome, polycystic ovary syndrome and gestational diabetes https://openheart.bmj.com/content/9/1...

frontiers | Frontiers in Nutrition

TYPE Original Research
PUBLISHED 07 February 2023
DOI 10.3389/fnut.2023.1092544

Myo-inositol supplementation improves cardiometabolic factors, anthropometric measures, and liver function in obese patients with non-alcoholic fatty liver disease

Sara Arefhosseini[1], Neda Roshanravan[2], Helda Tutunchi[3], Somayyeh Rostami[1], Manuchehr Khoshbaten[4] and Mehrangiz Ebrahimi-Mameghani[5]*

2g BD
8 weeks

- Anthropometic measures decreased significantly
- Weight reduction (P=0.049)

- Systolic blood pressure (P=0.006)
- Reductions in serum fasting insulin (p=0.008)
- Reductions in HOMA-IR (P=0.046)
- Significant improvements in lipid profile, liver enzymes, AST, ALT and serum ferritin

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Myo-Inositol Thyroid & BMI

Specifically, myo-inositol may help with weight loss in several ways:

- By supporting and balancing thyroid function
- By Improving sensitivity to thyroid hormone
- By reducing insulin resistance and lowering blood sugar levels
- By reducing the increases in insulin after glucose intake

Body Mass Index

Obesity Science and Practice
Open Access
OBESITY SOCIETY WORLD OBESITY

REVIEW | Open Access

Inositol supplementation and body mass index: A systematic review and meta-analysis of randomized clinical trials

Meysam Zarezadeh, Azadeh Dehghani, Amir Hossein Faghfouri, Nima Radkhah, Mohammad Naemi Kermanshahi, Fatemeh Hamedi Kalajahi ... See all authors

First published: 10 October 2021 | https://doi.org/10.1002/osp4.569 | Citations: 3

Thyroid Dysfunction

frontiers in Endocrinology
REVIEW
published: 10 May 2021
doi: 10.3389/fendo.2021.662582

The Role of Inositol in Thyroid Physiology and in Subclinical Hypothyroidism Management

Salvatore Benvenga[1,2], Maurizio Nordio[2,3], Antonio Simone Laganà[2,4] and Vittorio Unfer[2,5]*

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Magnesium

✓ Fuels mitochondria- ATP production
✓ Improves glucose homeostasis and insulin sensitivity
✓ Supports oestrogen detoxification
✓ Supports thyroid health
✓ Stabilises the HPA axis
✓ Increases vitamin D uptake
✓ Calms the nervous system

300-600mg glycinate daily

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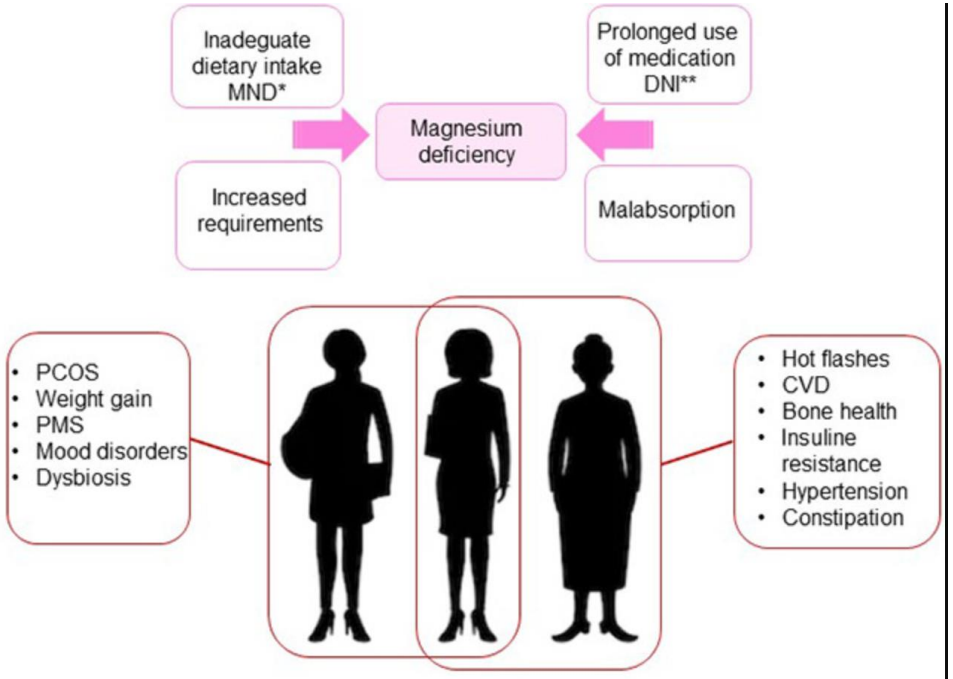
Magnesium Research



ELSEVIER

Effect of magnesium supplementation on women's health and well-being

Debora Porri [a,*], Hans K. Biesalski [b], Antonio Limitone [c], Laura Bertuzzo [c], Hellas Cena [a,d]

[a] Laboratory of Dietetics and Clinical Nutrition, Department of Public Health, Experimental and Forensic Medicine, University of Pavia, 27100 Pavia, Italy

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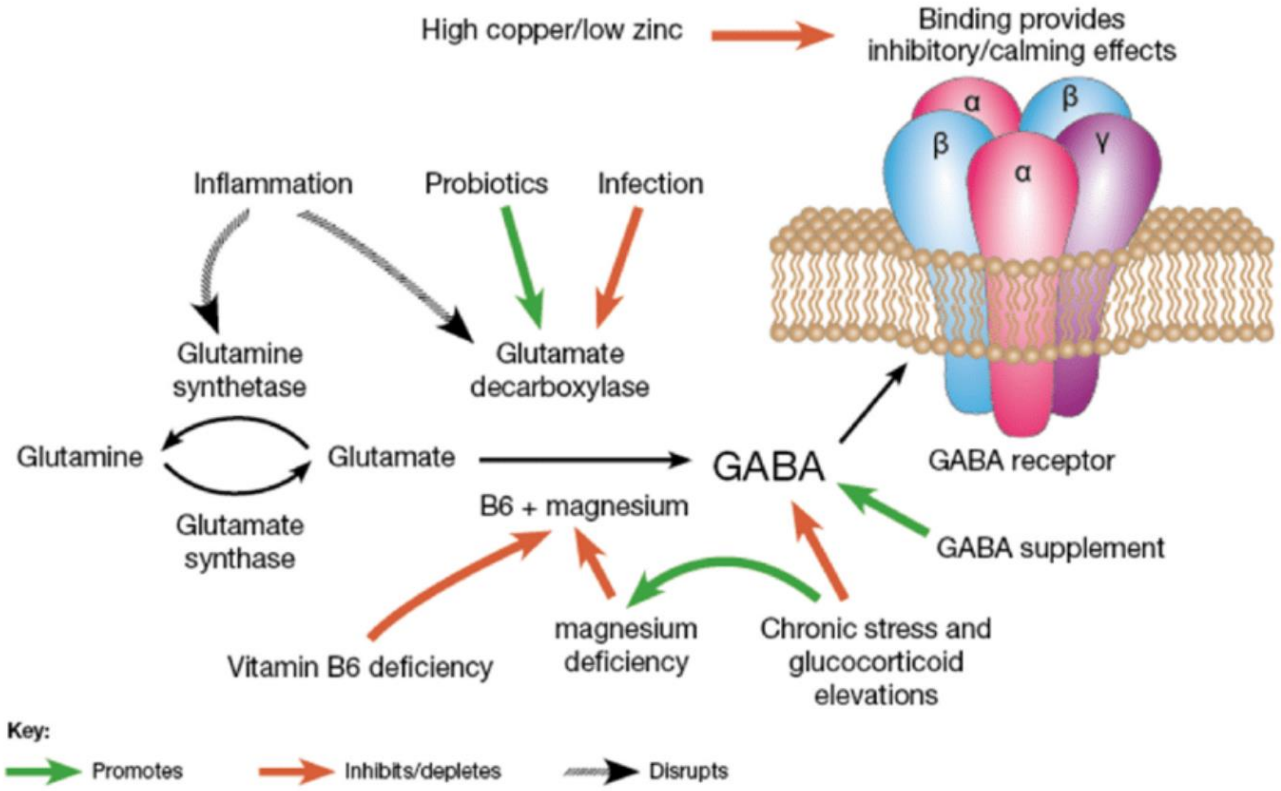
Magnesium Research



Taurine

✓ Supports mitochondrial function; inhibits ROS
✓ Improves insulin sensitivity
✓ Anti-inflammatory, quenches oxidative stress
✓ Counteracts bone mineral density loss

2-4g daily

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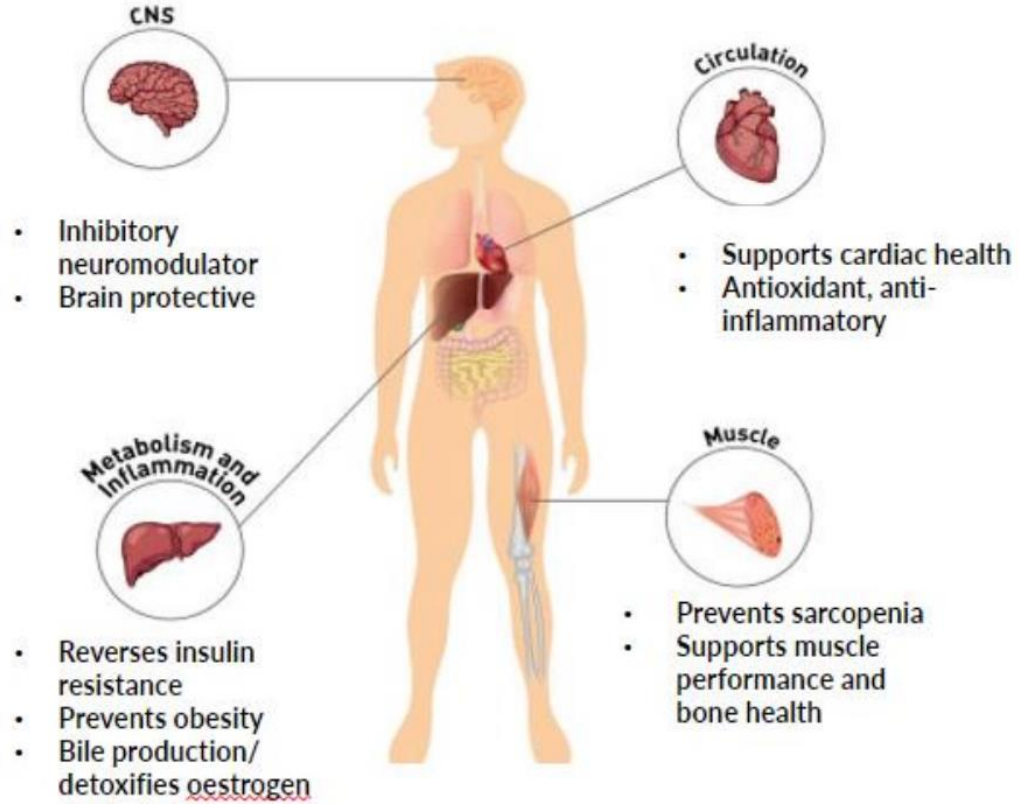
Taurine Research



- Inhibitory neuromodulator
- Brain protective

- Supports cardiac health
- Antioxidant, anti-inflammatory

- Reverses insulin resistance
- Prevents obesity
- Bile production/ detoxifies oestrogen

- Prevents sarcopenia
- Supports muscle performance and bone health

Amino Acids
https://doi.org/10.1007/s00726-020-02859-8

ORIGINAL ARTICLE

The effects of taurine supplementation on glycemic control and serum lipid profile in patients with type 2 diabetes: a randomized, double-blind, placebo-controlled trial

Vahid Maleki[1,2] · Mohammad Alizadeh[3] · Fatemeh Esmaeili[2] · Reza Mahdavi[3]

Received: 6 October 2019 / Accepted: 18 May 2020

After 8 weeks:

- ✓ Fasting blood sugar (p=0.01)
- ✓ Insulin (p=0.01)
- ✓ HOMA-IR (p=0.003)
- ✓ Total cholesterol (p=0.013)
- ✓ LDL-C (p=0.041)

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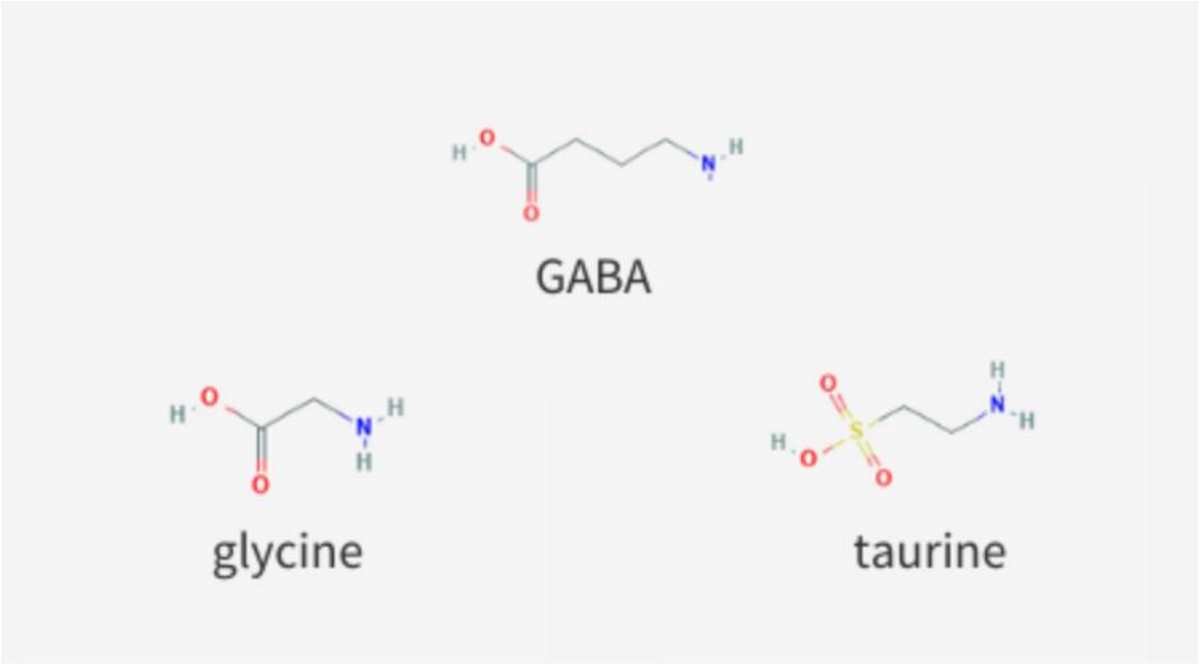
Taurine Research

Taurine is a ”calming” neurotransmitter similar in structure to GABA (gamma-aminobutyric acid) & Glycine — the brain’s other two calming neurotransmitters.



By interacting with GABA receptors, taurine helps to support beneficial “GABAergic” tone or overall GABA activity, thereby improving sleep, preventing migraines & relieving perimenopausal mood symptoms.

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Glycine

✓ Induces deeper REM restorative sleep
✓ Deficiency is associated with obesity and NAFLD
✓ Lowers markers of oxidative stress
✓ Improves liver detoxification- glutathione synthesis
✓ Calms the brain by inhibiting glutamate
✓ May control food intake

2-6g daily in divided doses. 3g to promote sleep

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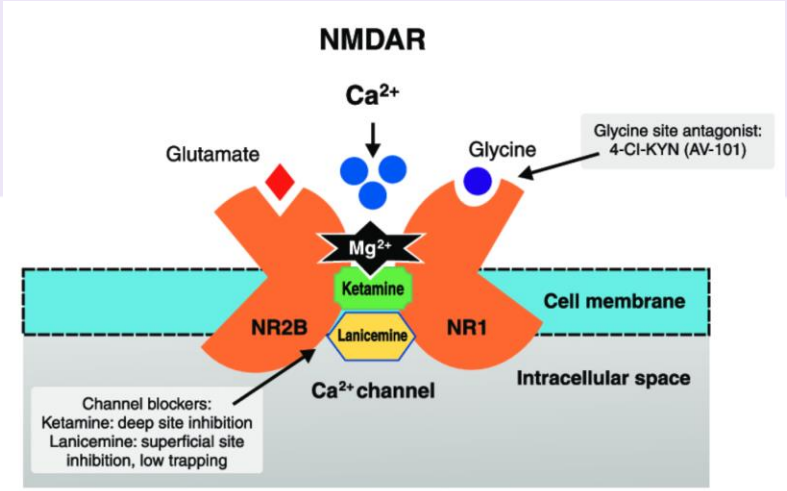
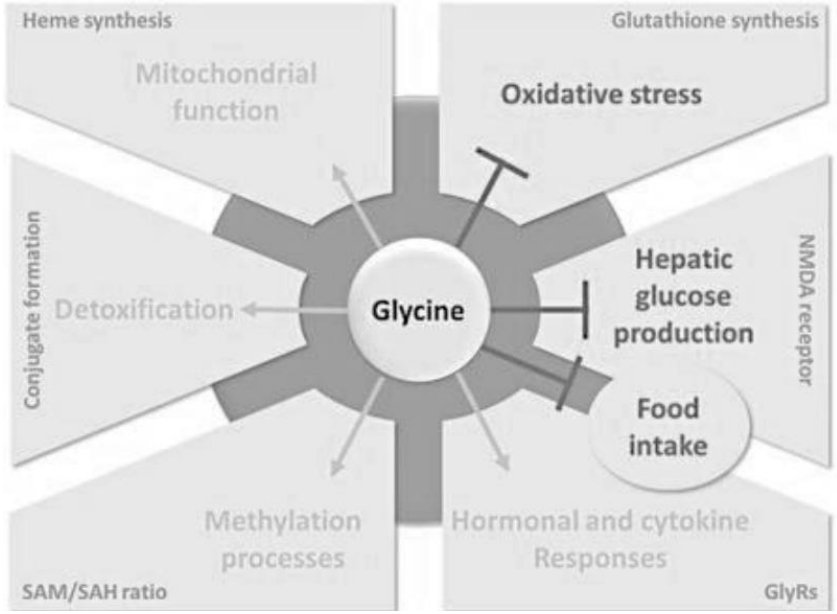
Glycine Research





nutrients

MDPI

Review

Glycine Metabolism and Its Alterations in Obesity and Metabolic Diseases

Anaïs Alves [1], Arthur Bassot [1], Anne-Laure Bulteau [2], Luciano Pirola [1] and Béatrice Morio [1,3,*]

The study also suggested that decreased plasma glycine concentration was associated with hepatic insulin resistance. This finding is supported by a recent meta-analysis, which showed that plasma glycine concentration is consistently lower in patients with obesity and T2DM compared to healthy individuals (−11 and −15%, respectively) [72]. Another meta-analysis showed that plasma glycine concentration has a very significant inverse association with the risk of developing T2DM [8]. In addition

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Nutraceuticals

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Nutraceuticals

Magnesium glycinate dihydrate	
equiv. Magnesium	
equiv. Glycine	
Glycine	
Total Glycine	
Taurine	
Passiflora incarnata herb ext dry conc (Passionflower)	
equiv. from Passiflora incarnata herb dry	
Melissa officinalis leaf ext dry conc (Lemon Balm)	
equiv. from Melissa officinalis leaf dry	

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Exclusive Masterclass

Mastering Functional Digestive Health

We're partnering with **Dr. Joe Mather**, MD, to bring you our second masterclass, focused on the management of IBS and functional gut disorders.

Throughout three online sessions, Dr. Joe will share his expert perspective on the strategies and tools that have proven effective in his practice.

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