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Lugano, Switzerland | 13 March 2026

Fueling Fertility: How nutrition, endocrine metabolism and the gut microbiota intersect

Gemma Fabozzi

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Reproductive Health Unit Director

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DIET QUALITY AND MORTALITY RISK

Healthy ageing is directly linked to the quality of the diet

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Association of Changes in Diet Quality with Total and Cause-Specific Mortality

Mercedes Sotos-Prieto, Ph.D., Shilpa N. Bhupathiraju, Ph.D., Josiemer Mattei, Ph.D., M.P.H., Teresa T. Fung, Sc.D., Yanping Li, Ph.D., An Pan, Ph.D., Walter C. Willett, M.D., Dr.P.H., Eric B. Rimm, Sc.D., and Frank B. Hu, M.D., Ph.D.

nature food

Brief Communication

https://doi.org/10.1038/s43016-023-00868-w

Life expectancy can increase by up to 10 years following sustained shifts towards healthier diets in the United Kingdom

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Published online: 20 November 2023

Lars T. Fadnes[1,2], Carlos Celis-Morales[3,4], Jan-Magnus Økland[1,5], Solange Parra-Soto[3,6], Katherine M. Livingstone[7], Frederick K. Ho[8], Jill P. Pell[8], Rajiv Balakrishna[1], Elaheh Javadi Arjmand[1,2], Kjell Arne Johansson[1,2,5], Øystein A. Haaland[1,5] & John C. Mathers[9]

The Journal of Nutrition

Nutritional Epidemiology

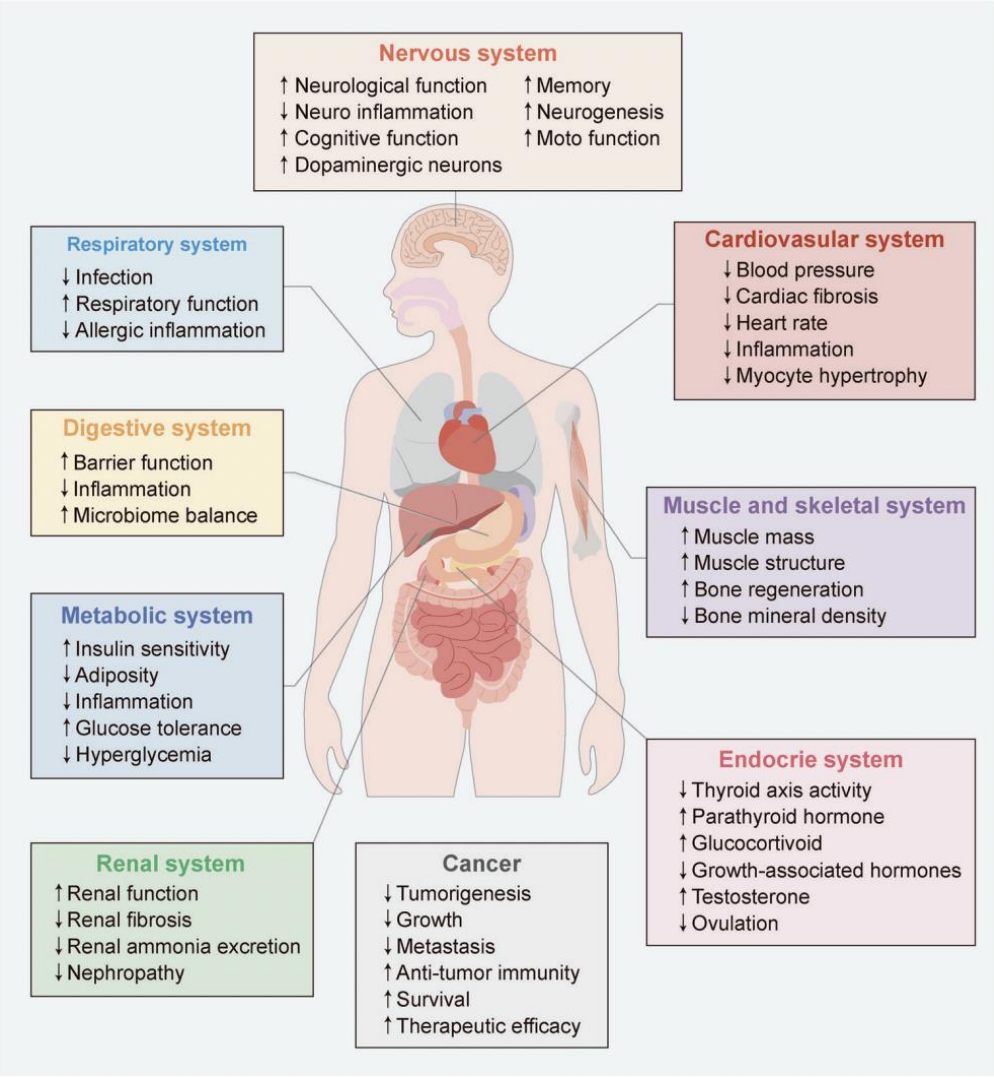
Diet Quality Is Associated with All-Cause Mortality in Adults Aged 65 Years and Older[1–3]

Sarah A. McNaughton,[4]* Chris J. Bates,[5] and Gita D. Mishra[6]

[4]Centre for Physical Activity and Nutrition Research, School of Exercise and Nutrition Sciences, Deakin University, Melbourne, Australia; [5]MRC Human Nutrition Research, Elsie Widdowson Laboratory, Cambridge, UK; and [6]School of Population Health, University of Queensland, Brisbane, Australia

Clinical evidence shows that sustained dietary change from unhealthy to longevity-associated dietary patterns is associated with **10.8 and 10.4 years gain in life expectancy** in males and females, respectively.

DIET PLAYS A KEY ROLE IN HEALTH AND DISEASE



Signal Transduction and Targeted Therapy

REVIEW ARTICLE OPEN

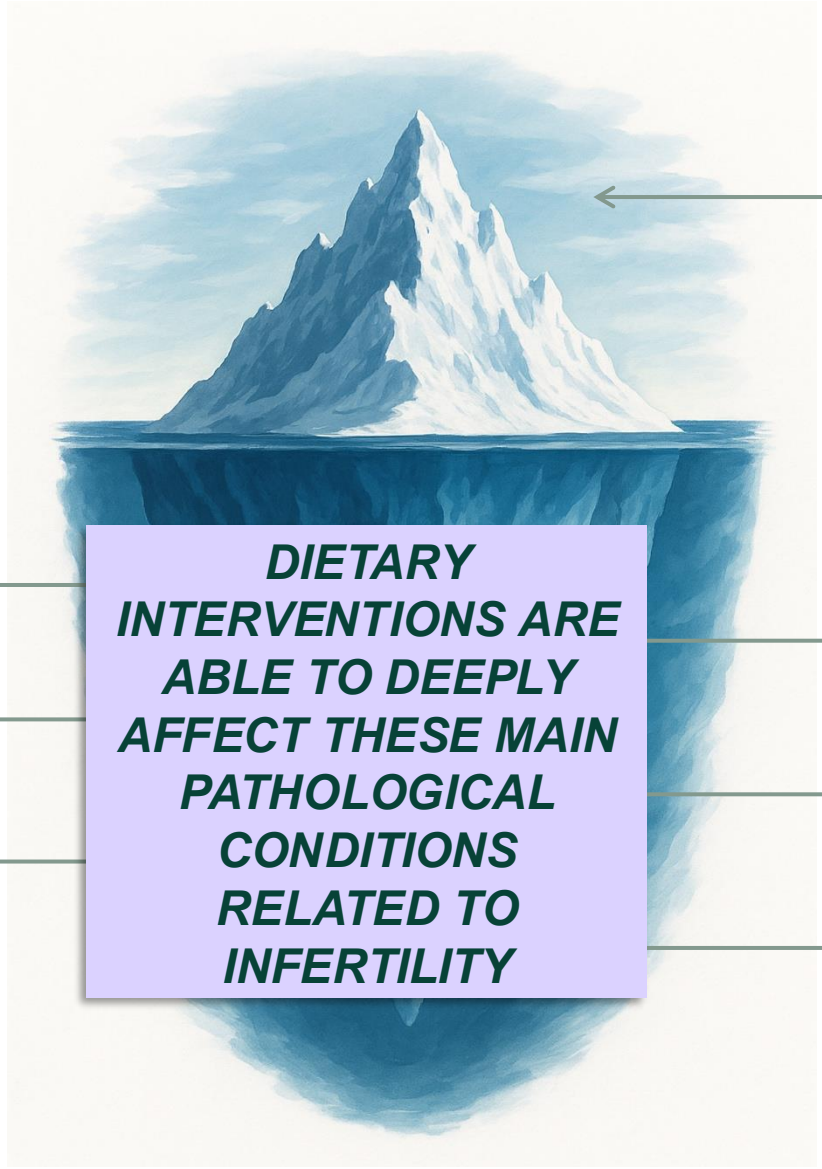
Dietary regulation in health and disease

Qi Wu[1], Zhi-Jie Gao[2], Xin Yu[2] and Ping Wang[1]✉

Dietary interventions are able to influence the **correct functioning of different organs and systems** improving health and **preventing multiple diseases in humans.**

How is diet linked to human reproduction?

INFERTILITY: THE TIP OF THE ICEBERG



Infertility

Under-Overweight

Impaired Glucose regulation

Autoimmunity

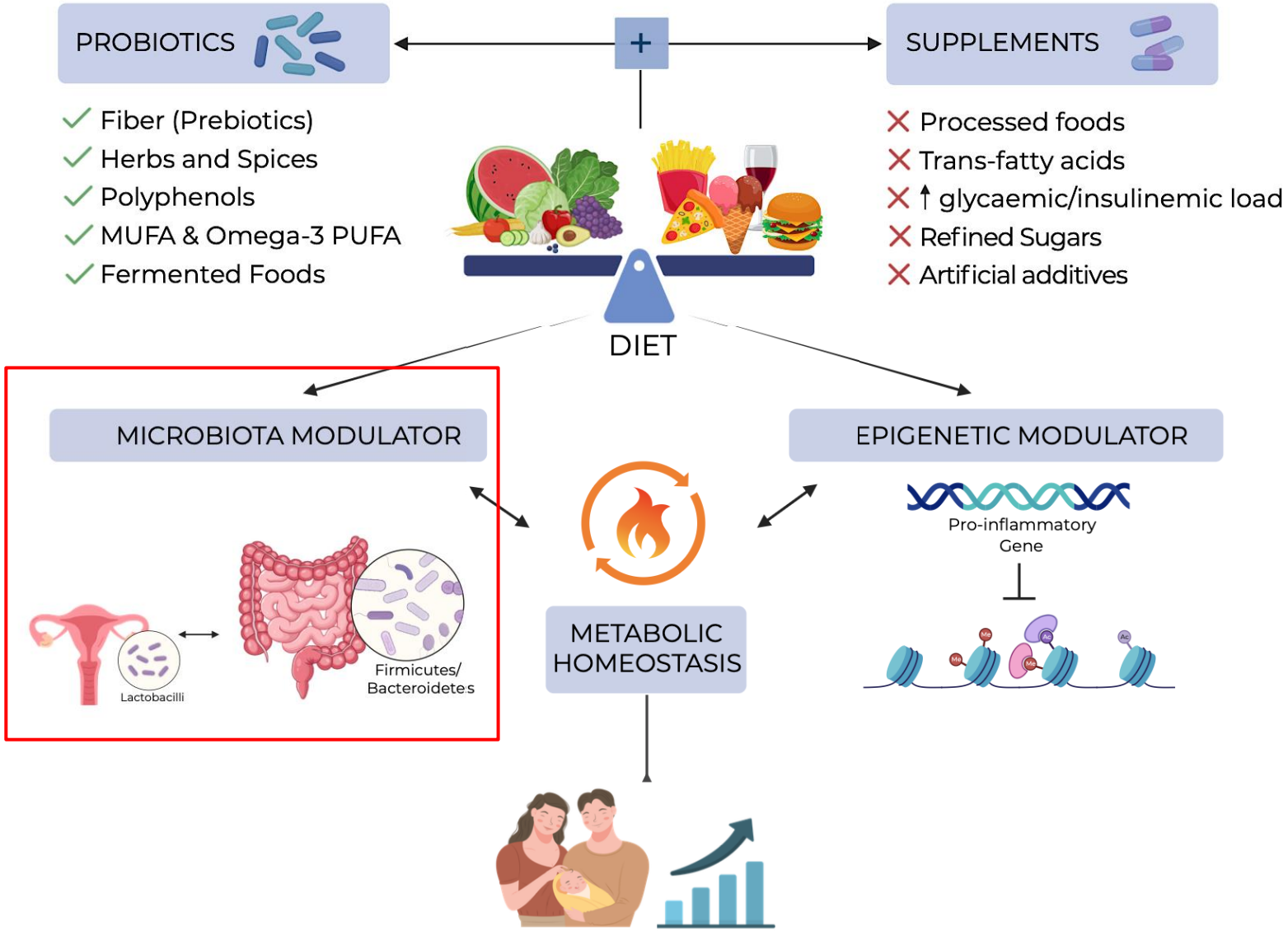
DIETARY INTERVENTIONS ARE ABLE TO DEEPLY AFFECT THESE MAIN PATHOLOGICAL CONDITIONS RELATED TO INFERTILITY

% Fat Mass

Gut Dysbiosis

Inflammation

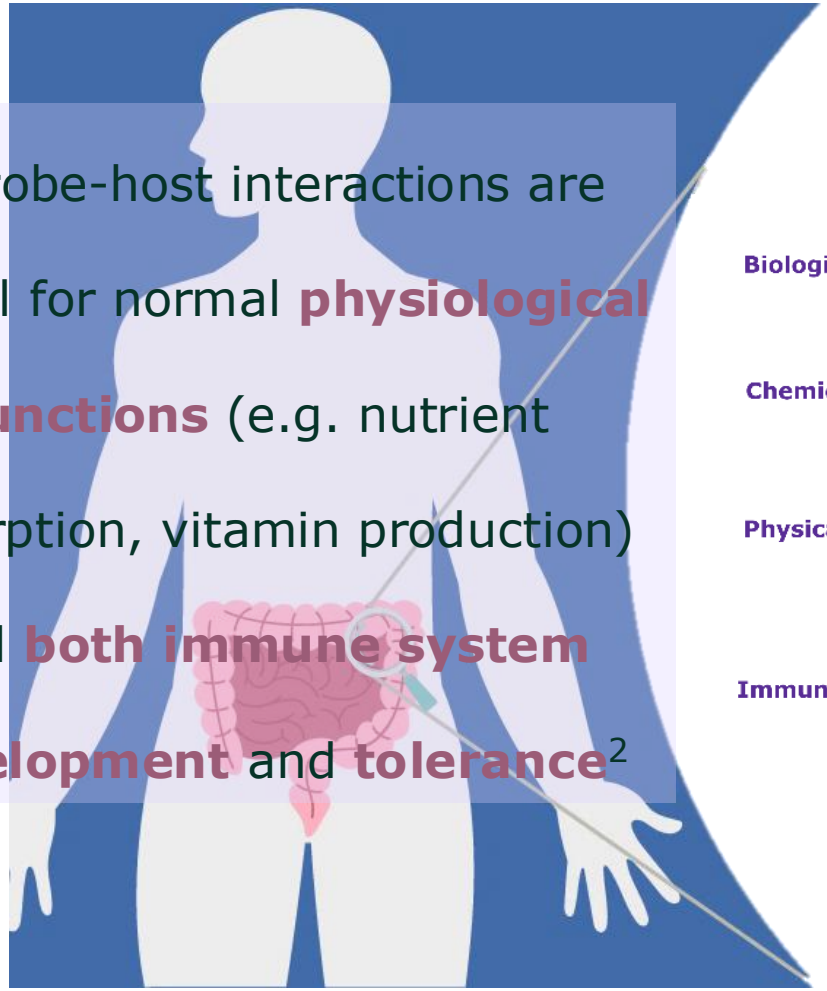
DIET IS ABLE TO AFFECT FERTILITY MODULATING TWO KEY ELEMENTS



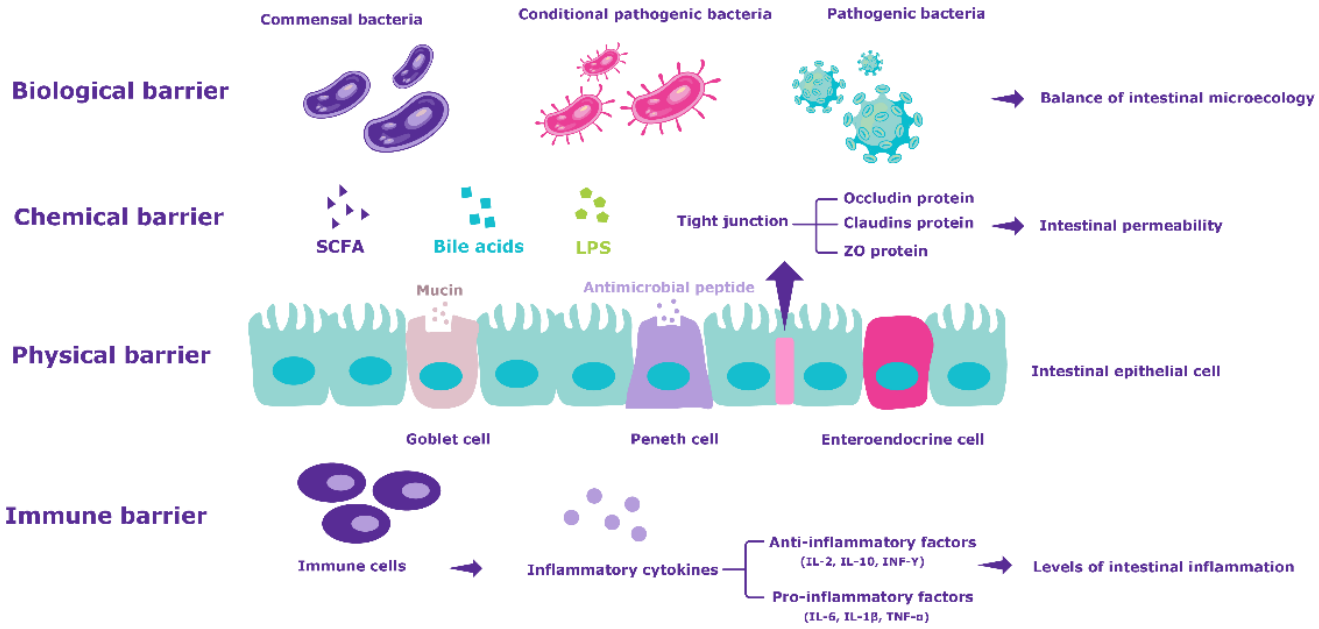
Fabozzi et al., RBMOnline 2026

THE KEY ROLE OF GUT MICROBIOTA FOR HUMAN HEALTH

The gastrointestinal tract harbours the largest microbial community in the human body[1]



- Microbe-host interactions are crucial for normal **physiological functions** (e.g. nutrient absorption, vitamin production) and **both immune system development** and **tolerance**[2]



***SFAC**, short chain fatty acid**; IL-6,** Interleukin-6; **LPS**, ipopolysaccharides; **TNF-α,** tumor necrosis factor-alpha*

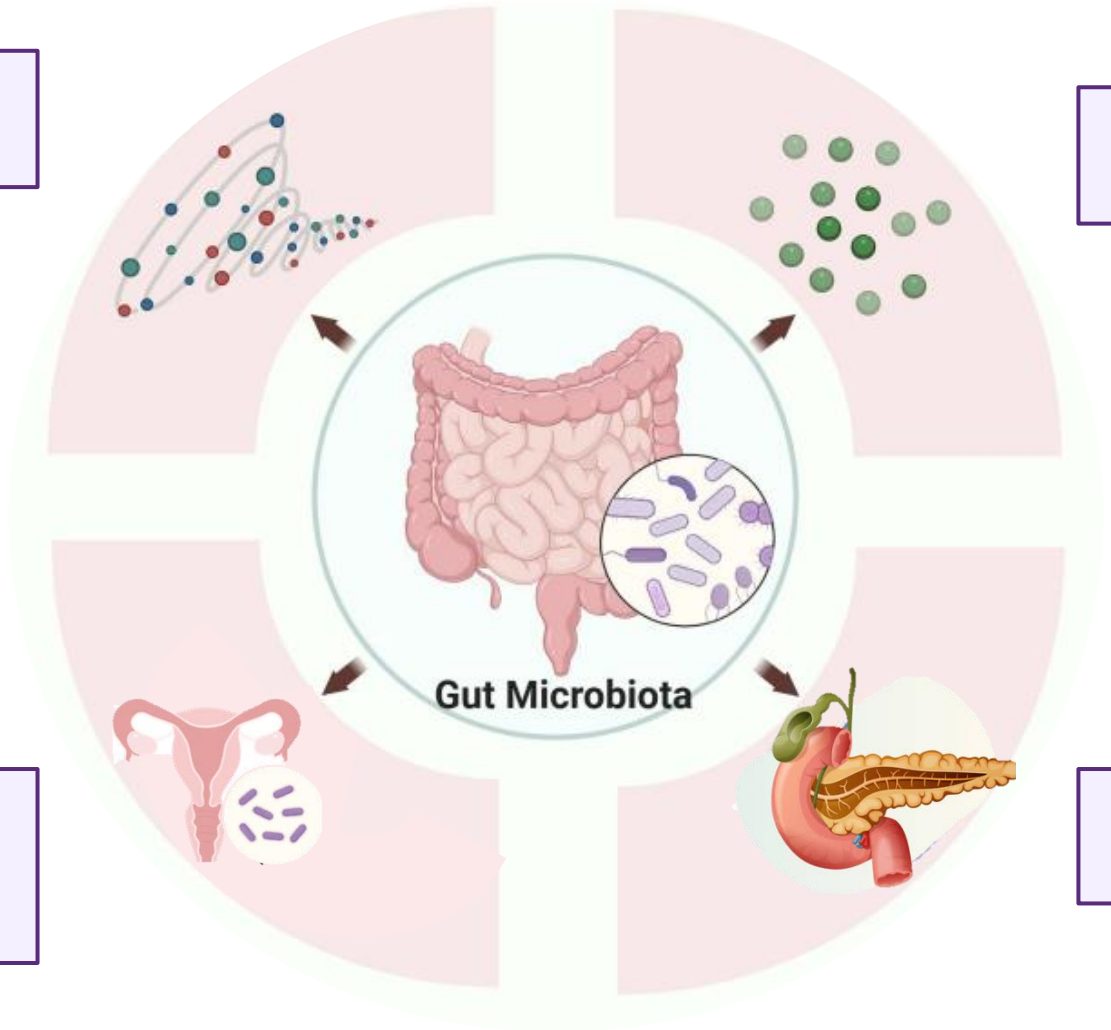
1. Savage DC. Annu Rev Microbiol. 1977;31:107-33. 2. Ou J, et al., Food Chem X. 2022;15:100444.

GUT MICROBIOTA AND REPRODUCTIVE HEALTH

The gut microbiota can influence several **key aspects** of female **reproductive health**

Immunity and Inflammation

Hormonal Levels



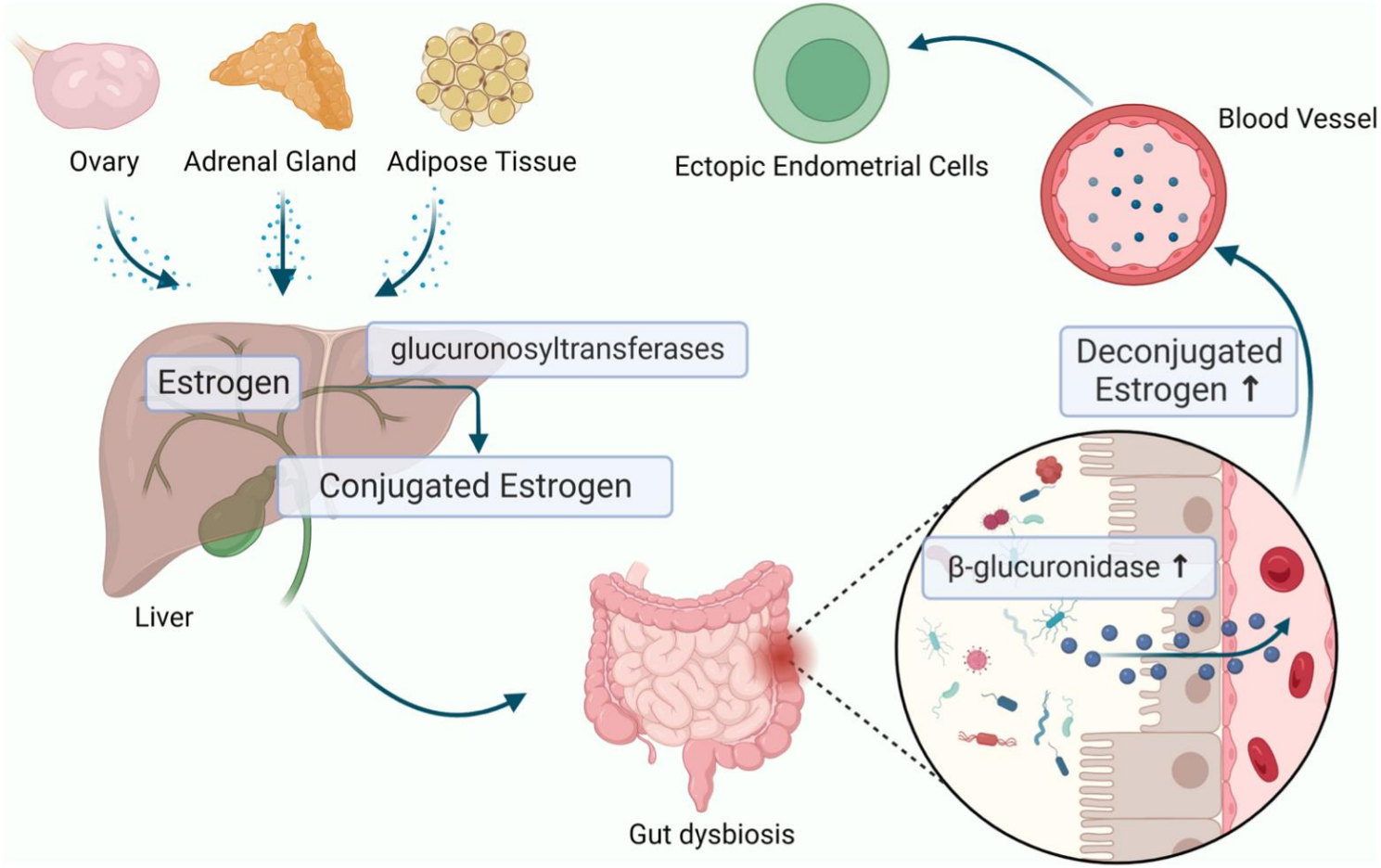
Microbiota composition at distal sites

Metabolic Health

GUT MICROBIOTA IS ABLE TO AFFECT THE LEVEL OF SEX HORMONES

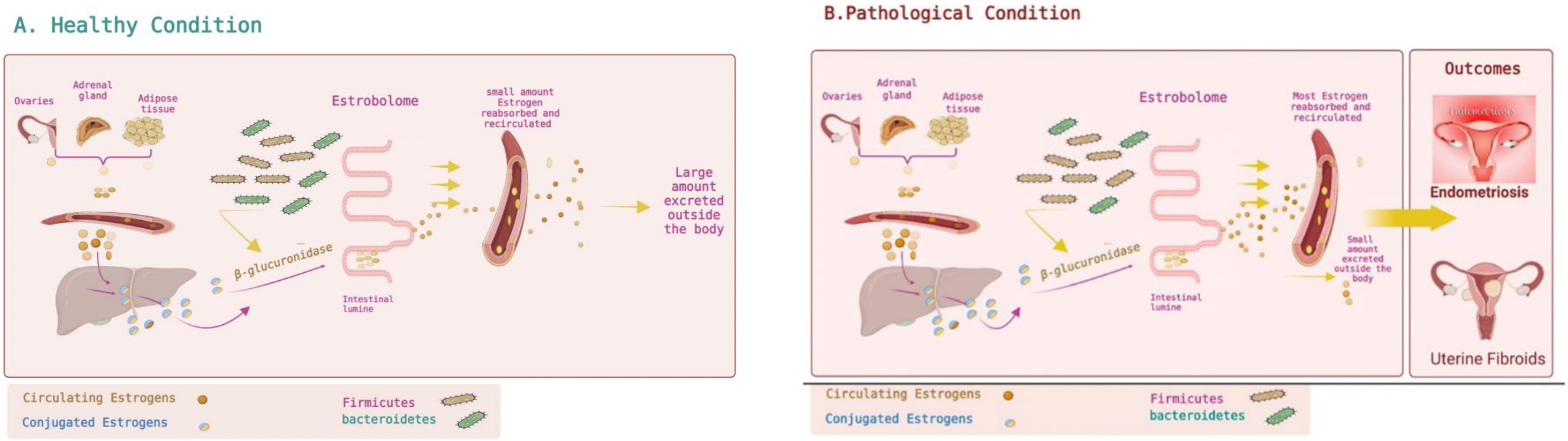
A subset of gut bacteria — collectively known as the **estrobolome** — produces **β-glucuronidase** (β-GUS), an enzyme that modulates estrogen metabolism by influencing enterohepatic circulation.

β-GUS deconjugates estrogens, reducing their excretion and promoting their reabsorption into the bloodstream



Guo C and Zhang C (2024). *Front. Microbiol.* 15:1363455.

IMPACT OF GUT DYSBIOSIS ON ESTROGEN METABOLISM



Dysbiosis can lead to the:

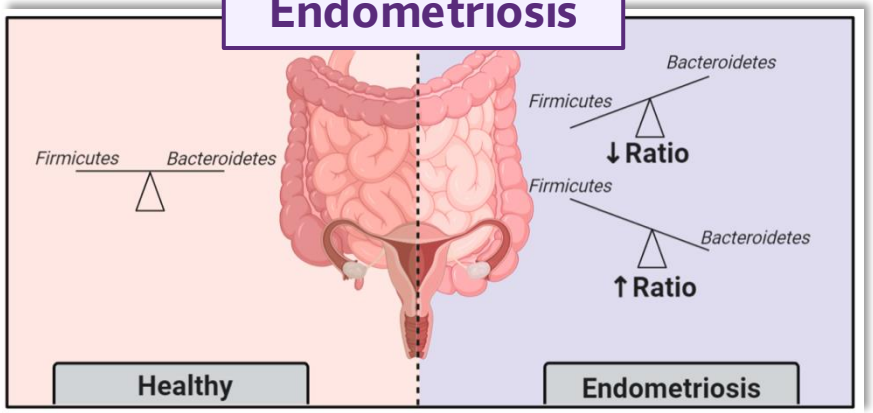
- **increase** of b-glucuronidase-producing bacteria leading to a hyperstrogenic pathologic status (e.g.endometriosis, UF)
- **reduction** in the abundance of b-glucuronidase-producing bacteria leading to a hypoestrogenic pathologic status (e.g. PCOS)

GUS, b-glucuronidase

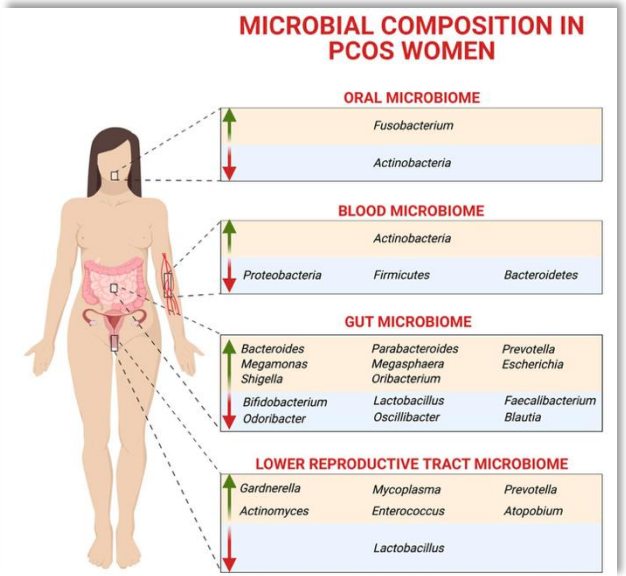
Elkafas H, et al., Front Cell Infect Microbiol. 2022

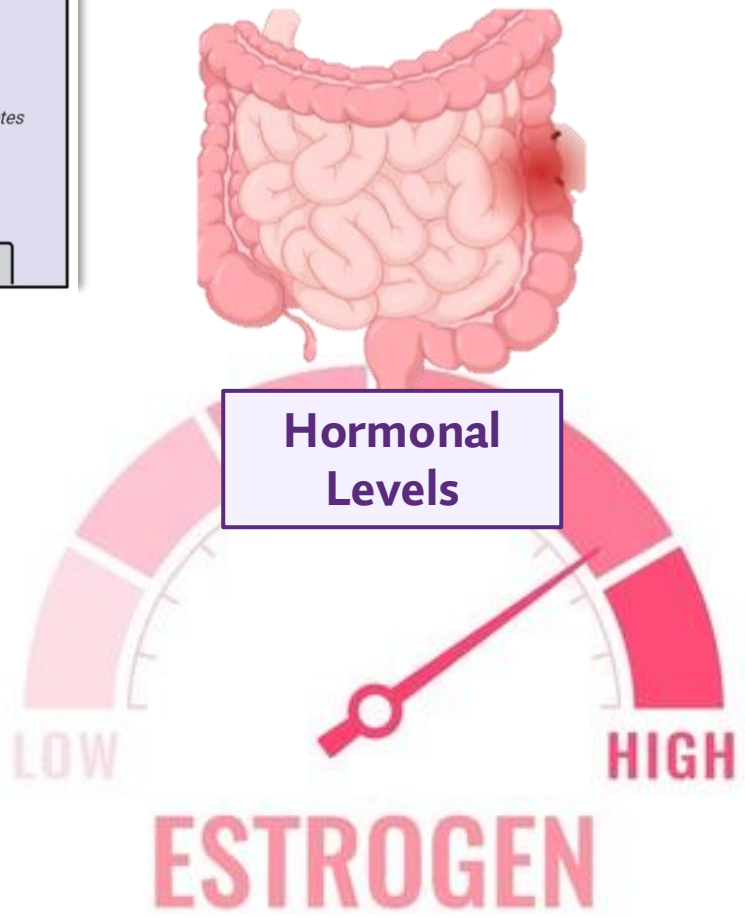
GUT MICROBIOTA DYSBIOSIS AND INFERTILITY RELATED DISEASES

1 Endometriosis

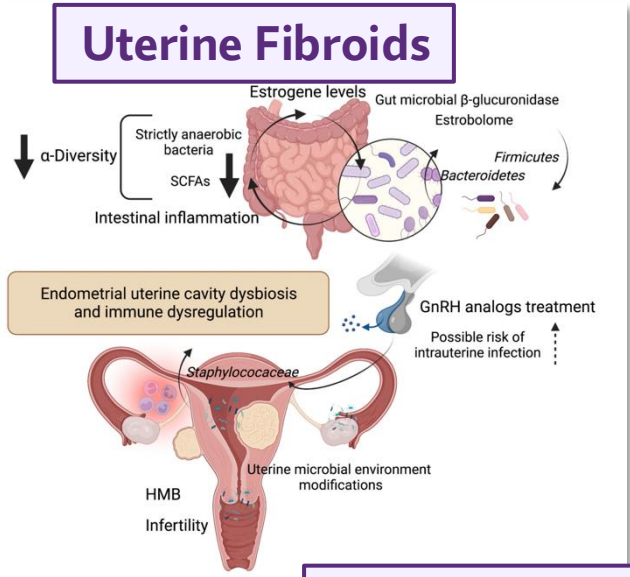


2 PCOS





3 Uterine Fibroids



4 POI

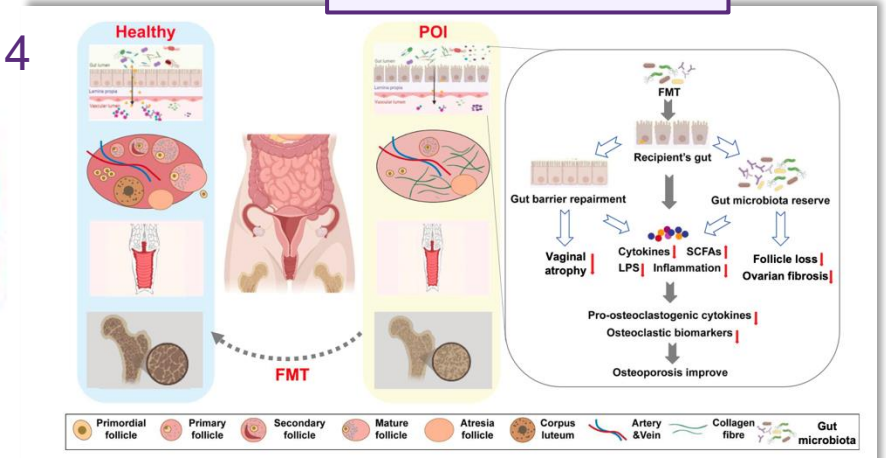
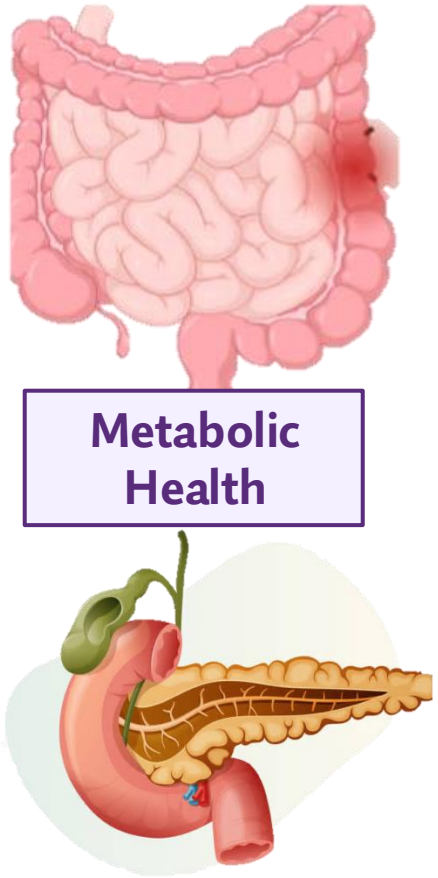
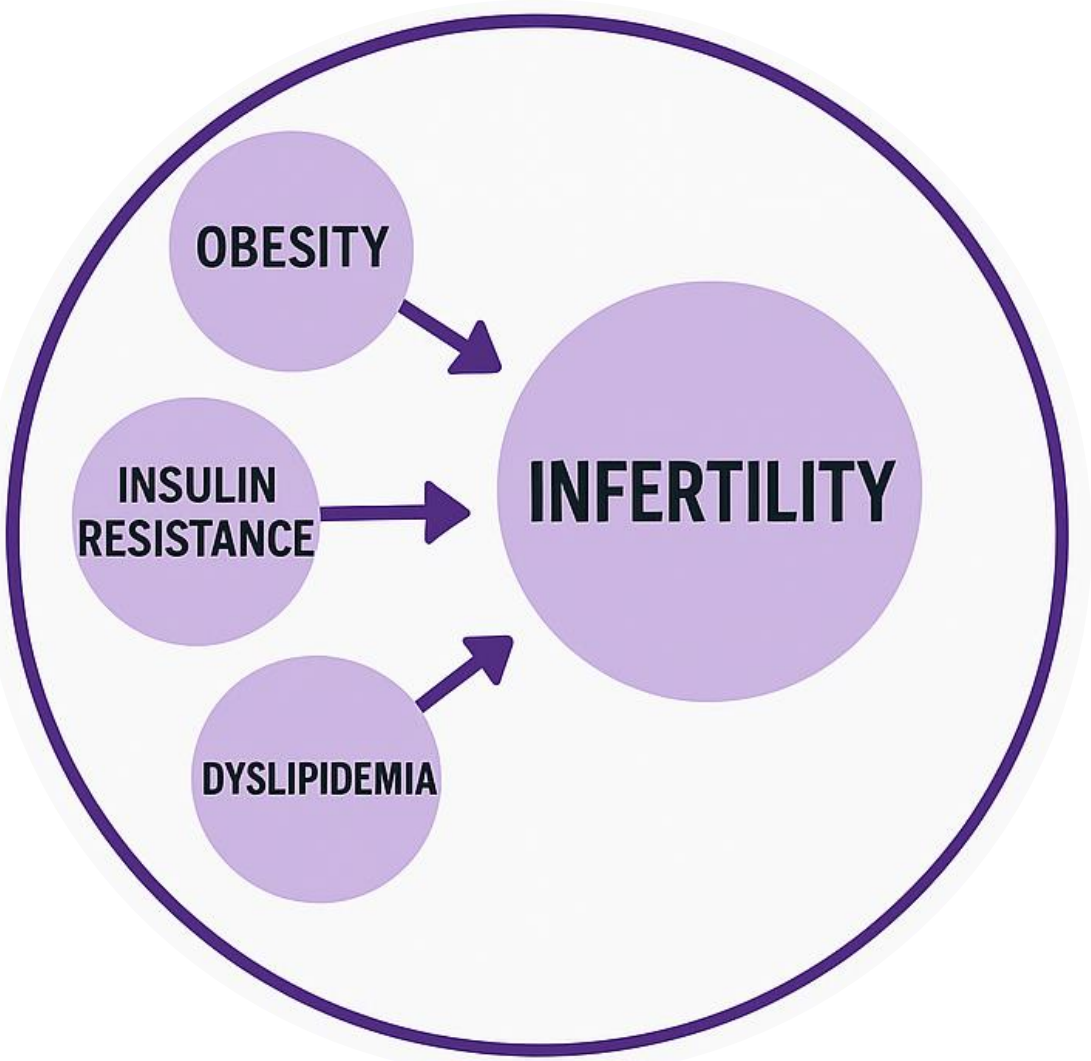


Figure 2. FMT alter the gut microbiota and slow the progression of ovarian aging related diseases.

GUT MICROBIOTA DYSBIOSIS AND METABOLIC DISEASES

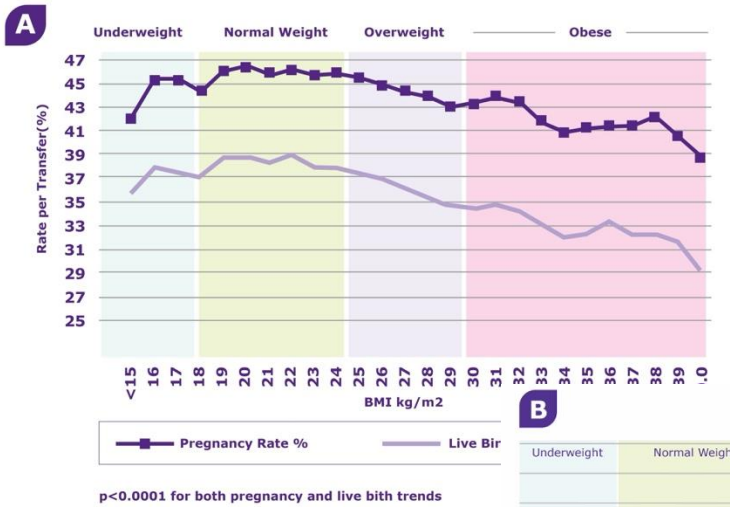


METABOLIC DISORDERS INCREASE THE RISK OF INFERTILITY



Women affected by OBESITY have:

- a statistically significant **lower LBR**[1]
- **higher miscarriage rate** even in case of **euploid ET**[2]



p<0.0001 for both pregnancy and live bith trends

US registry analysis: almost 500,000 cycles

p<0.0001 for miscarriage trend

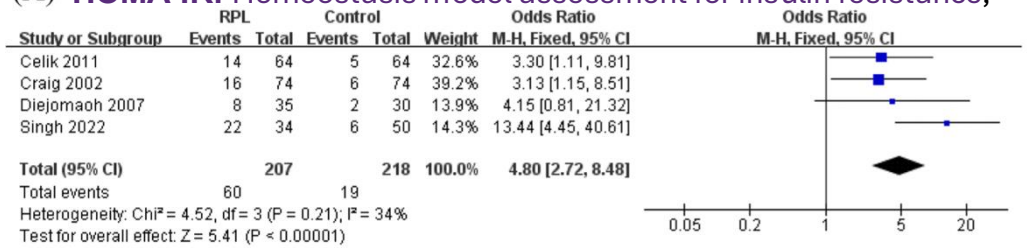
1. Kawwass J F, et al.,. Fertil Steril. 2016;106(7):1742-1750;
2. Bakkensen JB, et al., Fertil Steril. 2024; 121(2):271-280.

METABOLIC DISORDERS INCREASE THE RISK OF INFERTILITY

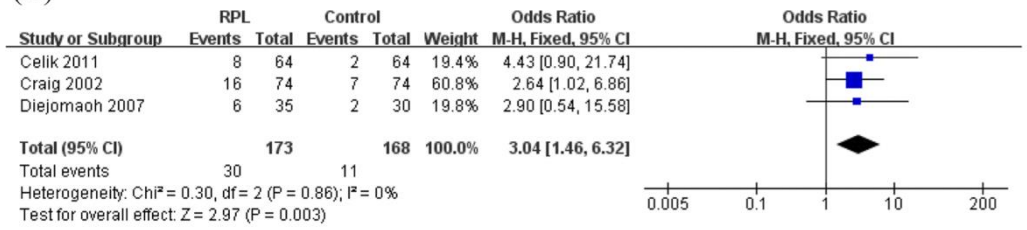
INSULIN RESISTANCE is associated with a statistically significant risk of **Recurrent Pregnancy loss** [1,2]

Women with **DISLIPIDEMIA** have significantly lower **implantation, clinical pregnancy,** and **live birth rates**[3].

(A) **HOMA-IR:** Homeostasis model assessment for insulin resistance;



(B) **GI ratio:** : Glucose to insulin ratio



(C) **FIN:** Fasting insulin;

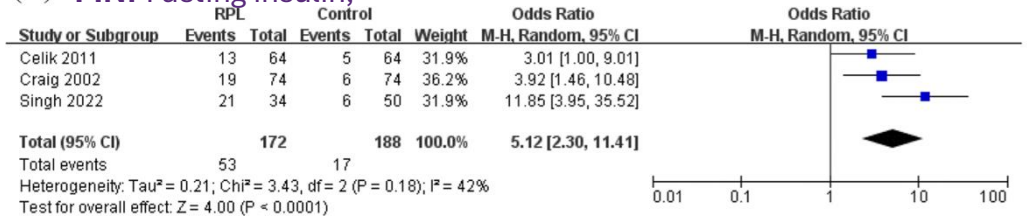
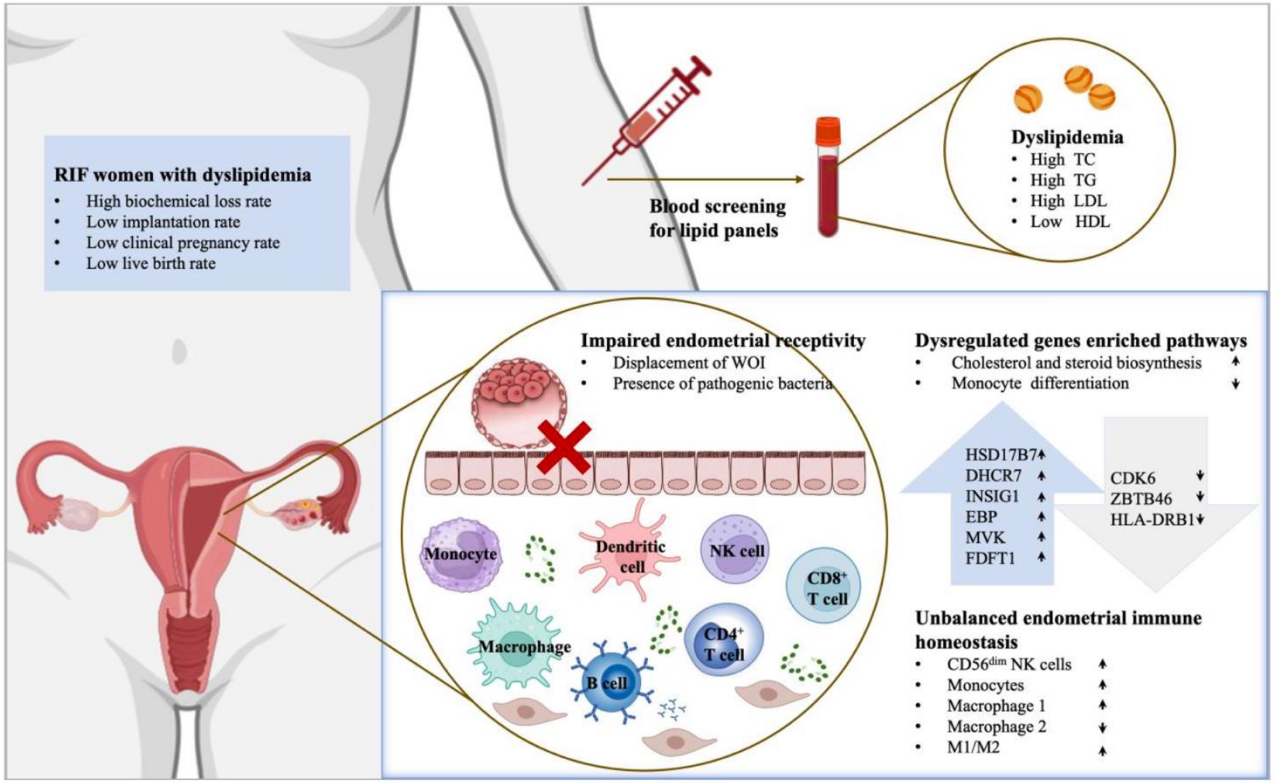


Fig. 6 Meta-analysis of IR between the recurrent pregnancy loss and control groups. **A**) HOMA-IR > 4.5, **B**) GI ratio < 4.5, **C**) FIN > 20

19 studies involving 4453 women



6499 infertile women, including 5618 non-RIF and 881 RIF.

1. Cai W Y, et al. BMC Pregnancy Childbirth. 2022;22(1):916. 2. Hantoushzadeh S, et al., Diabetol Metab Syndr. 2023;15(1):6
3. Zhang Y, et al., . J Clin Endocrinol Metab. 2025 16;110(11)

ROLE OF GM IN THE PATHOGENESIS OF METABOLIC DISORDERS

frontiers | Frontiers in Endocrinology

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Editorial: Emerging roles of the gut microbiota in the pathogenesis of metabolic disorders, volume II

Jieying Liu*

Published in final edited form as:
Nat Chem Biol. 2021 October ; 17(10): 1046–1056. doi:10.1038/s41589-021-00861-z.

Chains of evidence from correlations to causal molecules in microbiome-linked diseases

Snehal N. Chaudhari[1,*], Megan D. McCurry[1], A. Sloan Devlin[1,*]

Associations between the microbiome and host phenotypes

Change in the microbiome	Disease	Humans or rodents
Bacteroidetes/Firmicutes ratio positively correlates with plasma glucose;body weight[94];[95]	Obesity/T2D	Humans
Bacteroidetes/Firmicutes ratio negatively correlates with body weight[94]	Obesity	Humans
Bacteroidetes/Firmicutes ratio differentially correlates with BMI based on gender[96]	Obesity	Humans
Bacteroidetes positively correlates with BMI; negatively correlates with BMI; does not correlate with BMI[97];[95];[44]	Obesity	Humans
Lactobacillus, Betaproteobacteria positively assiosiated with plasma glucose[94]	T2D	Humans
Akkermansia negatively associated with plasma glucose, waist-to-hip ratio and subcutaneous adipocyte diameter[10]	Obesity/T2D	Humans
Decreased *Roseburia* spp., *Faecalibacterium prausnitzii*; decreased *B. theta Bifidobacteria spp.*,[11];[13]	Hypertension	Humans
Increased *Klebsiella* spp.[11];[13]	Hypertension	Humans

Adapted from Chaudhari et al., 2021[2]

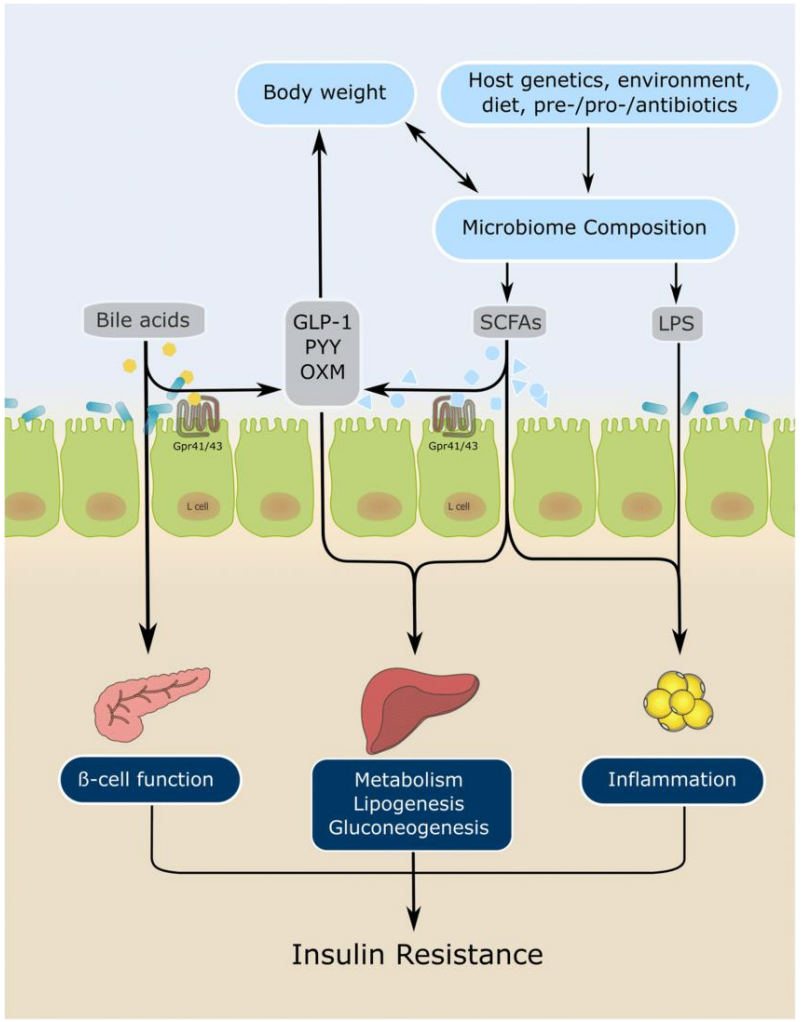
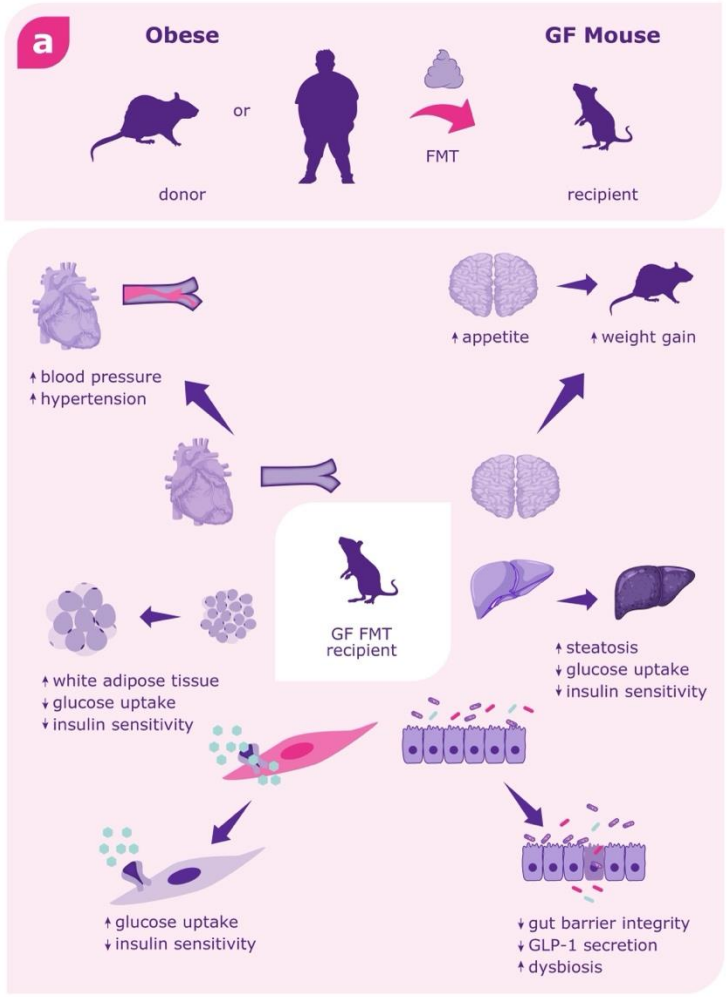


Image from Aydin, et al., 2018[1]

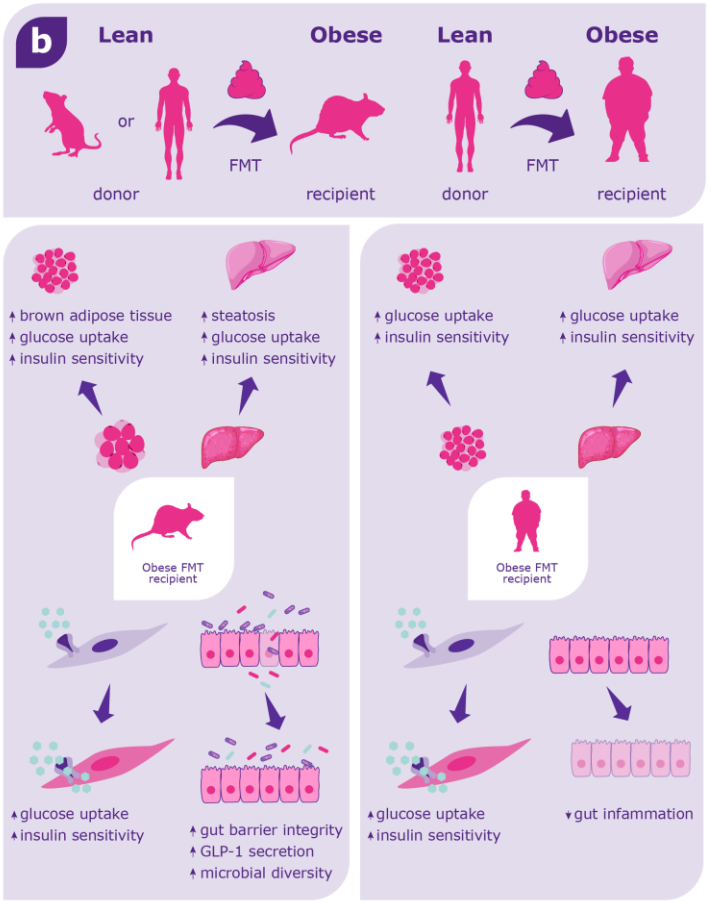
1. Aydin Ö, et al., Curr Diab Rep. 2018; 2. Chaudhari S.N, et al., Nat Chem Biol. 2021;

ROLE OF GM IN THE PATHOGENESIS OF METABOLIC DISORDERS



FMT from obese humans or mice transfers disease-associated phenotypes into recipient mice.

Specifically, GF recipients exhibit decreased glucose uptake, insulin sensitivity and impaired gut barrier integrity, and increased liver steatosis, blood pressure, and weight gain

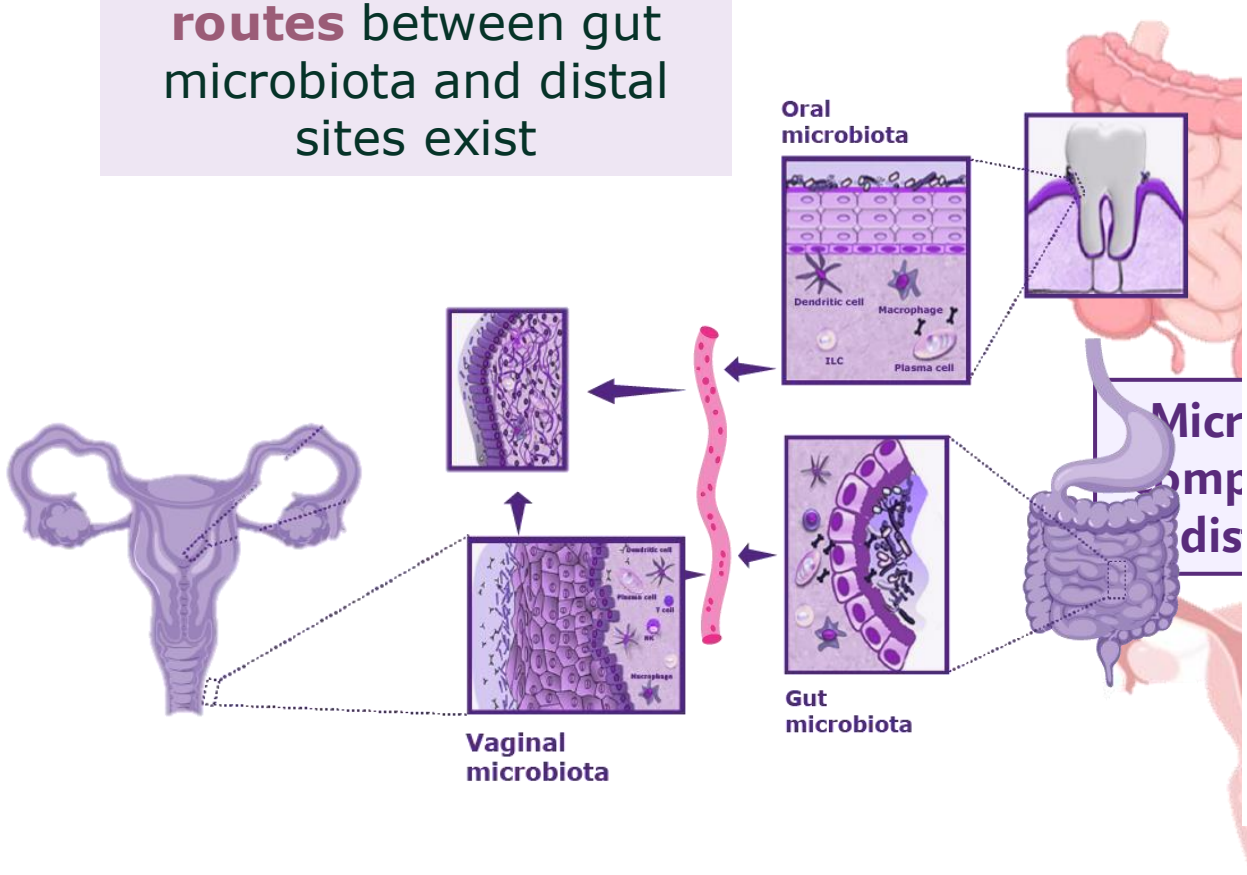


FMT from lean donors ameliorates metabolic phenotypes in recipients

Chaudhari, S.N., et al., Nat Chem Biol. 2021;17:1046–1056

GUT MICROBIOTA AFFECTS MICROBIAL ENVIRONMENT AT DISTAL SITES

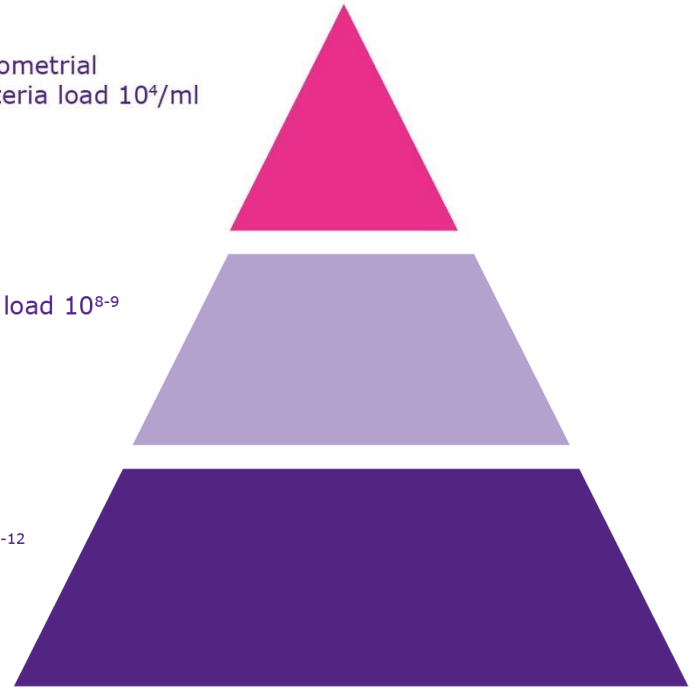
Bacterial **transmission routes** between gut microbiota and distal sites exist



Endometrial Microbiota

Vaginal Microbiota

Faecal (Gut) Microbiota



THE GUT MICROBIOTA-GONADAL AXIS

frontiers | Frontiers in Immunology

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OPEN ACCESS

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REVIEWED BY
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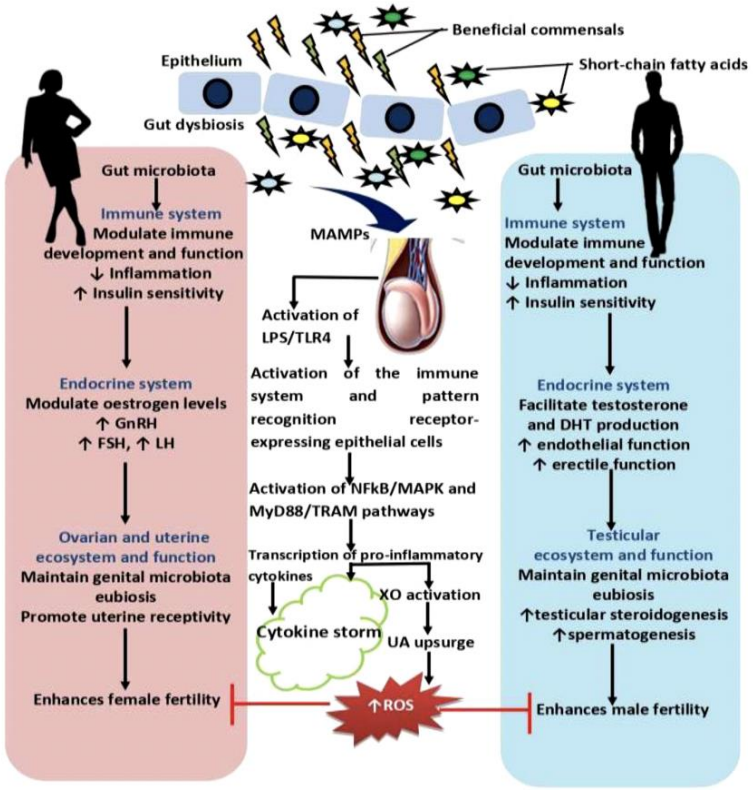
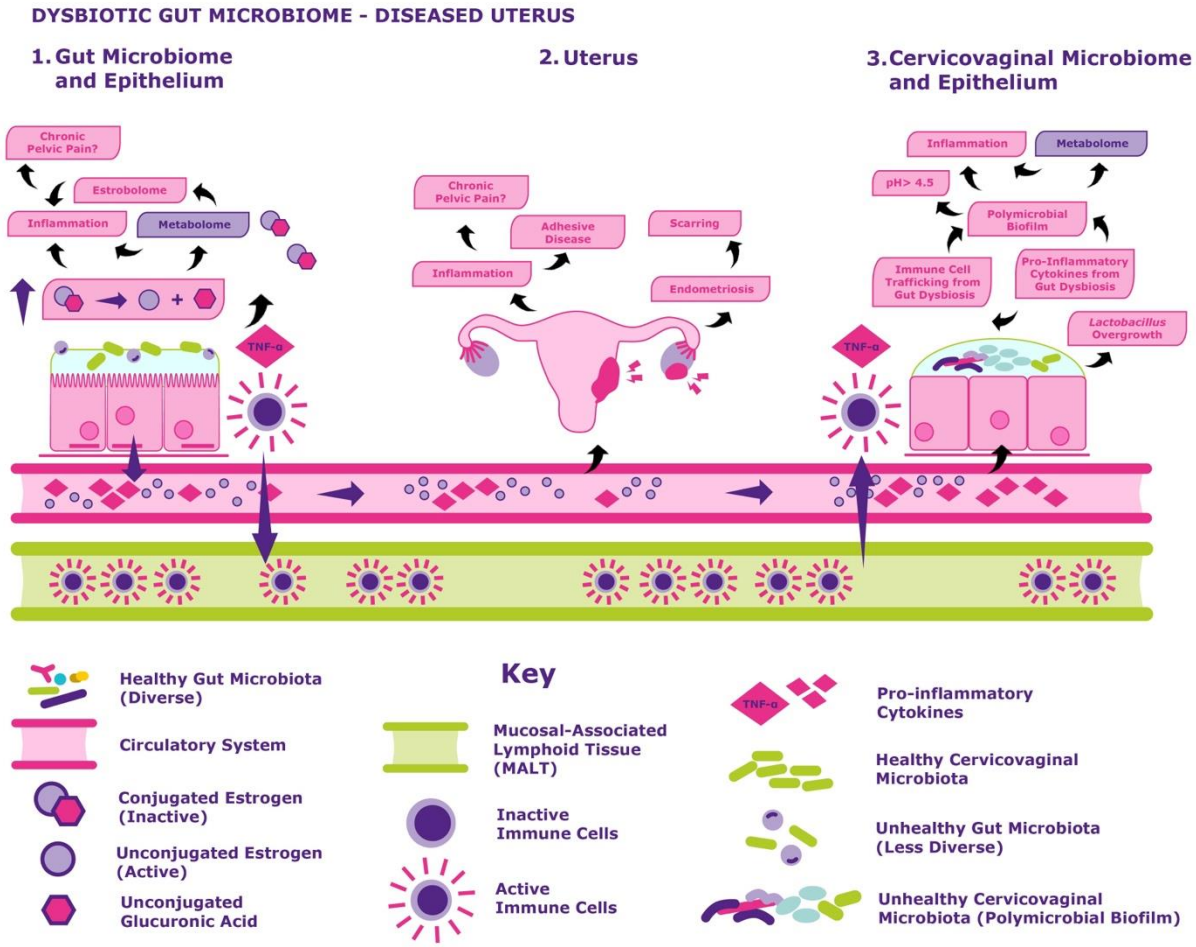
University of Tennessee Health Science Center (UTHSC), United States

Gut microbiota-gonadal axis: the impact of gut microbiota on reproductive functions

Victory J. Ashonibare[1,2,3], Bolaji A. Akorede[3,4], Precious J. Ashonibare[3,5], Tunmise M. Akhigbe[3,6] and Roland Eghoghosoa Akhigbe[3,5]*





Salliss et al., Hum Reprod Update. 2021; 28(1): 92-131

DIET IS THE MAIN MODULATOR OF MICROBIOTA COMPOSITION

nutrients

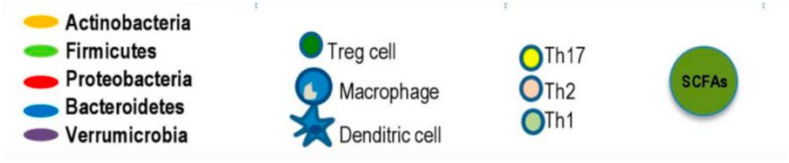
MDPI

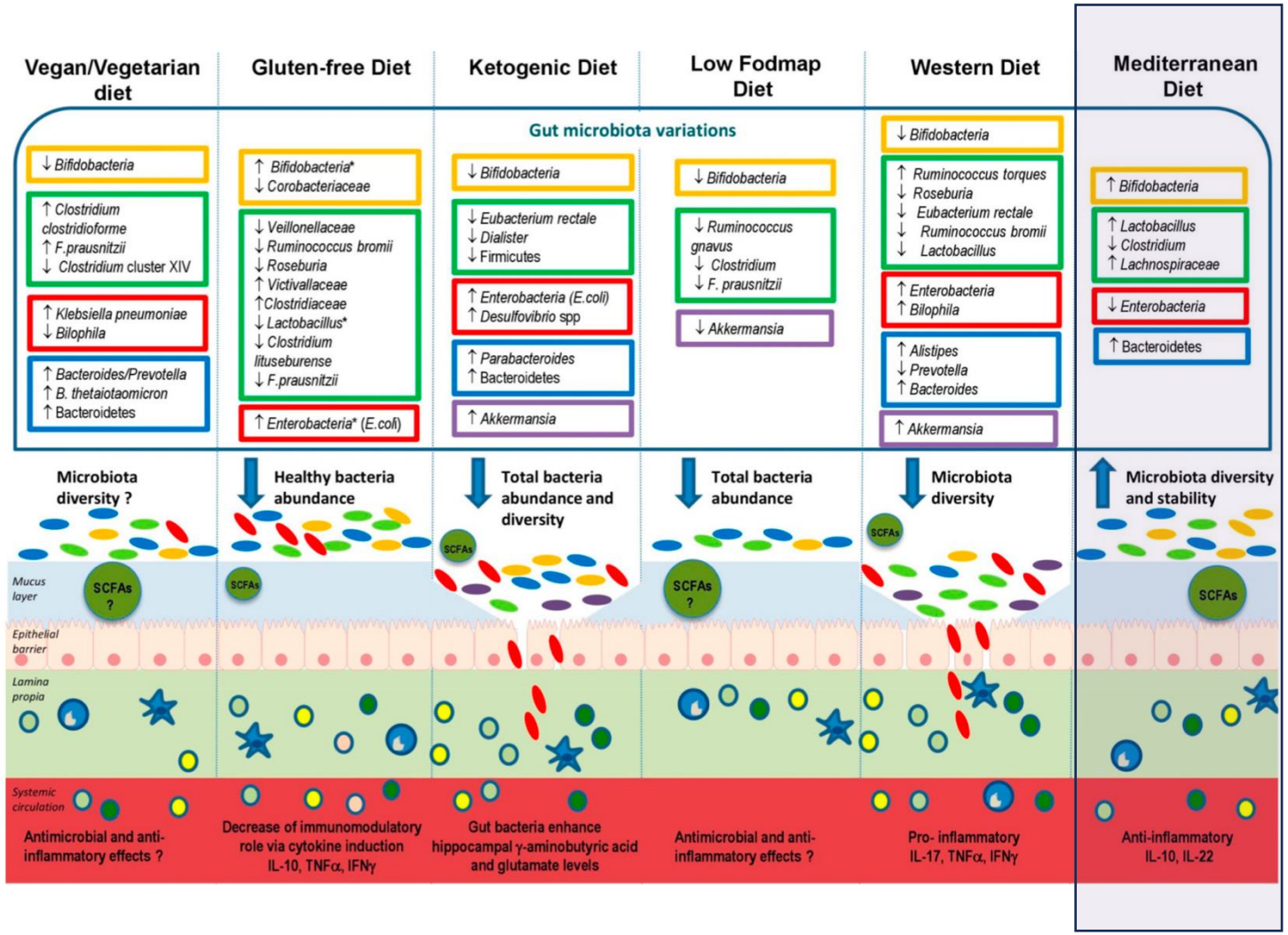
Review

Food Components and Dietary Habits: Keys for a Healthy Gut Microbiota Composition

Emanuele Rinninella [1,2,*], Marco Cintoni [3], Pauline Raoul [2], Loris Riccardo Lopetuso [2,4], Franco Scaldaferri [2,4], Gabriele Pulcini [3], Giacinto Abele Donato Miggiano [1,2], Antonio Gasbarrini [2,4] and Maria Cristina Mele [1,2]

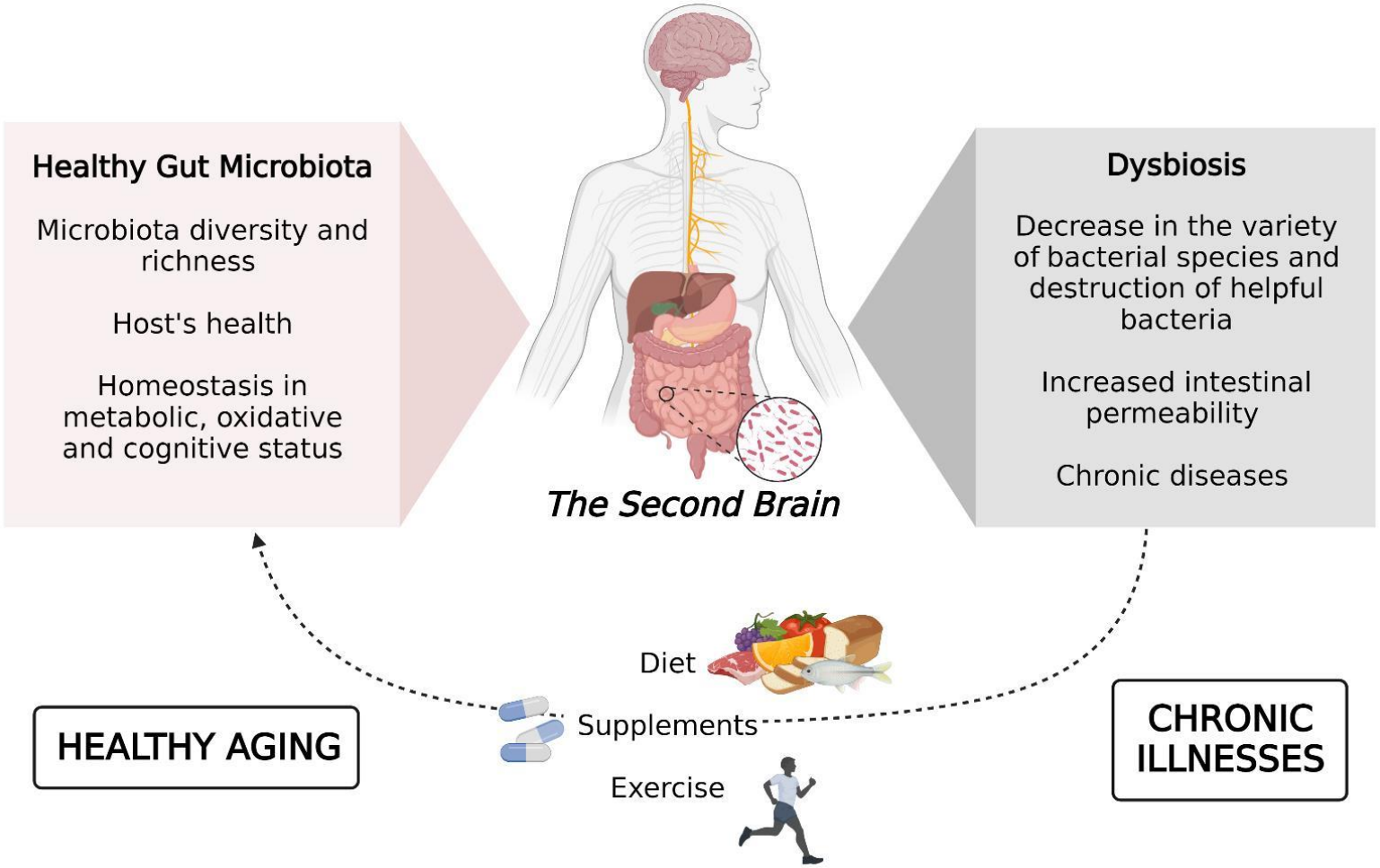
Food components have a key impact on the gut microbiota, influencing its composition in terms of **richness** and **diversity**.





MICROBIOTA DIVERSITY: A MARKER OF HUMAN HEALTH

Both the **richness** and **diversity** of the gut microbiota appear crucial in the development of different chronic diseases[1,2]



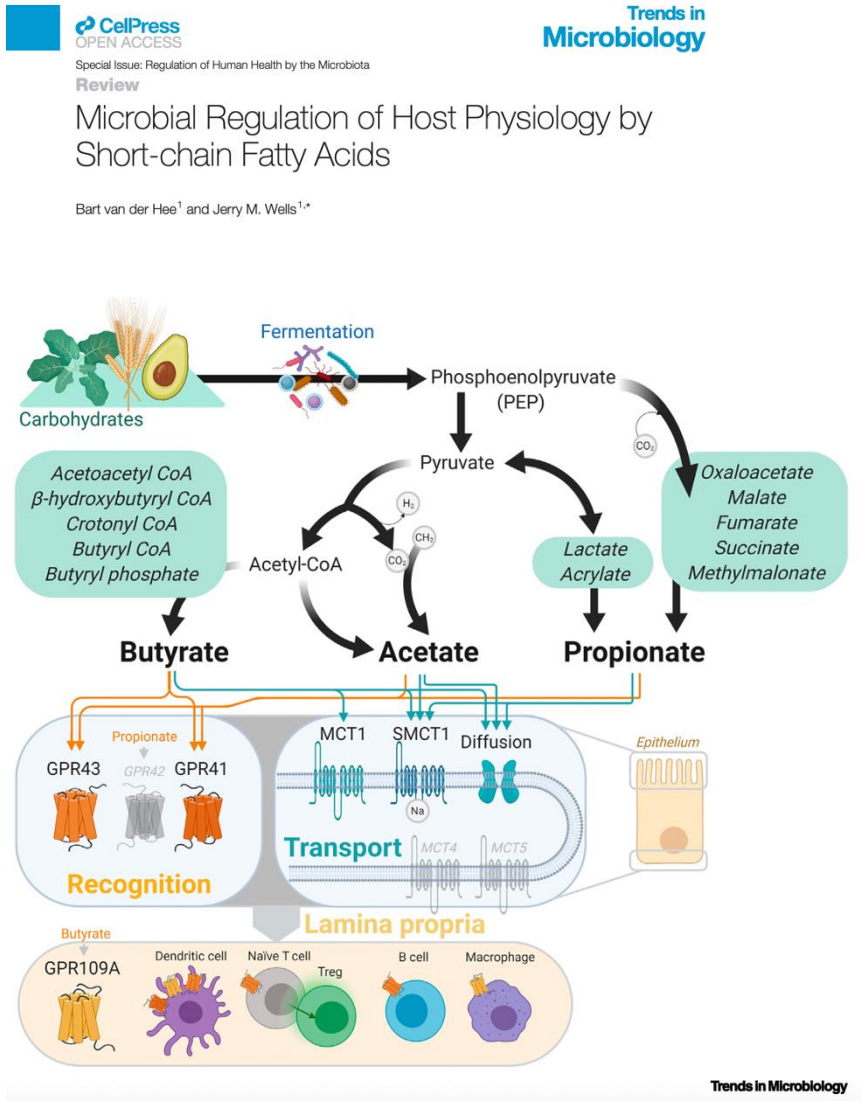
1. Donati Zeppa S, et al., Cells. 2022 Dec 22;12(1):34;
2. B and Wells JM. Trends Microbiol. 2021;29(8):700-712

Image adapted from Salliss et al., 2021[2]

GUT-DERIVED METABOLITES : A MARKER OF HUMAN HEALTH

- **Short-chain fatty acids** are metabolic by- products of fibers reaching the colon and anaerobically fermented by the gut bacteria.

- They play a key role in **intestinal homeostasis** and induce epigenetic changes and **epigenetic imprinting in utero** during gestation[2]



ROLE OF SCFA IN INHIBITING THE PRO-INFLAMMATORY ENVIRONMENT

SCFAs can exert anti-inflammatory effects through two signal pathways

- **Inhibiting** the activation of the inflammasome, reducing the secretion of pro-inflammatory cytokines.
- **Inhibiting** histone deacetylases to reduce production of the proinflammatory tumor necrosis factor

frontiers | Frontiers in Microbiology

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REVIEWED BY
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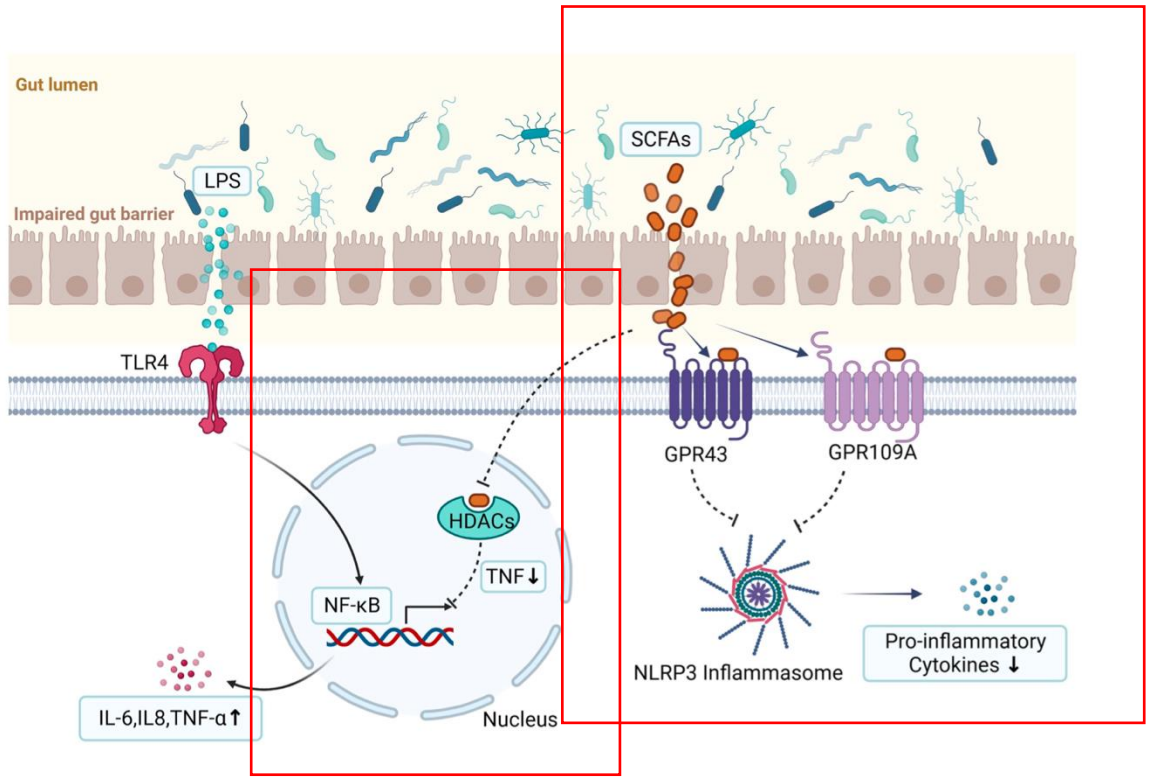
Role of the gut microbiota in the pathogenesis of endometriosis: a review

Cuishan Guo and Chiyuan Zhang*



ROLE OF SCFA IN SAFEGUARDING THE OVARIAN RESERVE

Cell Host & Microbe

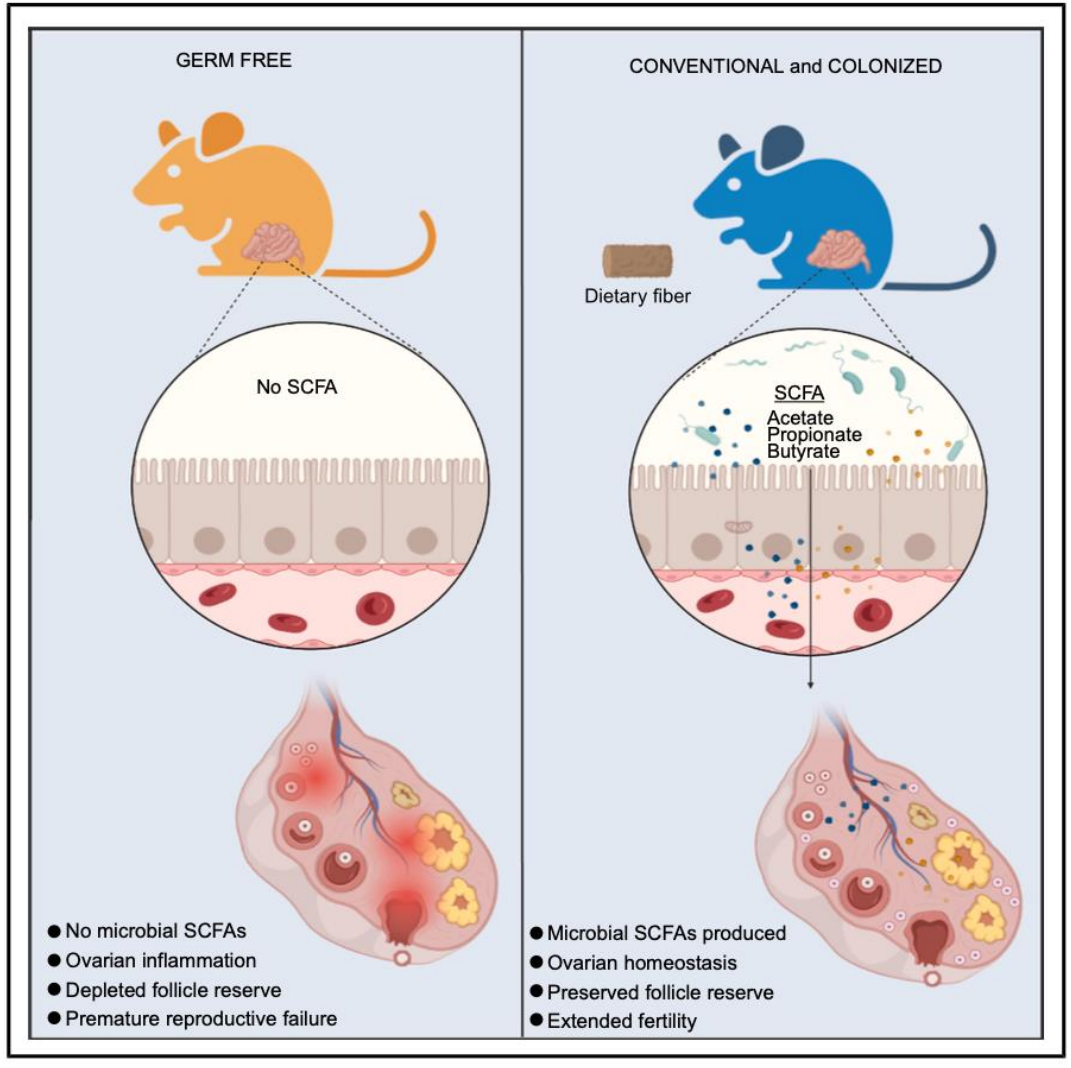
CellPress
OPEN ACCESS

Article

The microbiota extends the reproductive lifespan of mice by safeguarding the ovarian reserve

Sarah K. Munyoki,[1,2,3] Julie P. Goff,[1,2,3] Amanda Reshke,[1,2,3] Erin Wilderoter,[1,2,3] Nyasha Mafarachisi,[1,2,3] Antonija Kolobaric,[1,2,3] Yi Sheng,[1,3] Steven J. Mullett,[4,5] Gabrielle E. King,[3] Jacob D. DeSchepper,[8] Richard J. Bookser,[8] Carlos A. Castro,[1,3] Stacy L. Gelhaus,[4,5] Mayara Grizotte-Lake,[6] Kathleen E. Morrison,[7] Anthony J. Zeleznik,[1,3] Timothy W. Hand,[8,9] Miguel A. Brieño-Enriquez,[1,3] and Eldin Jašarević[1,2,3,10,*]

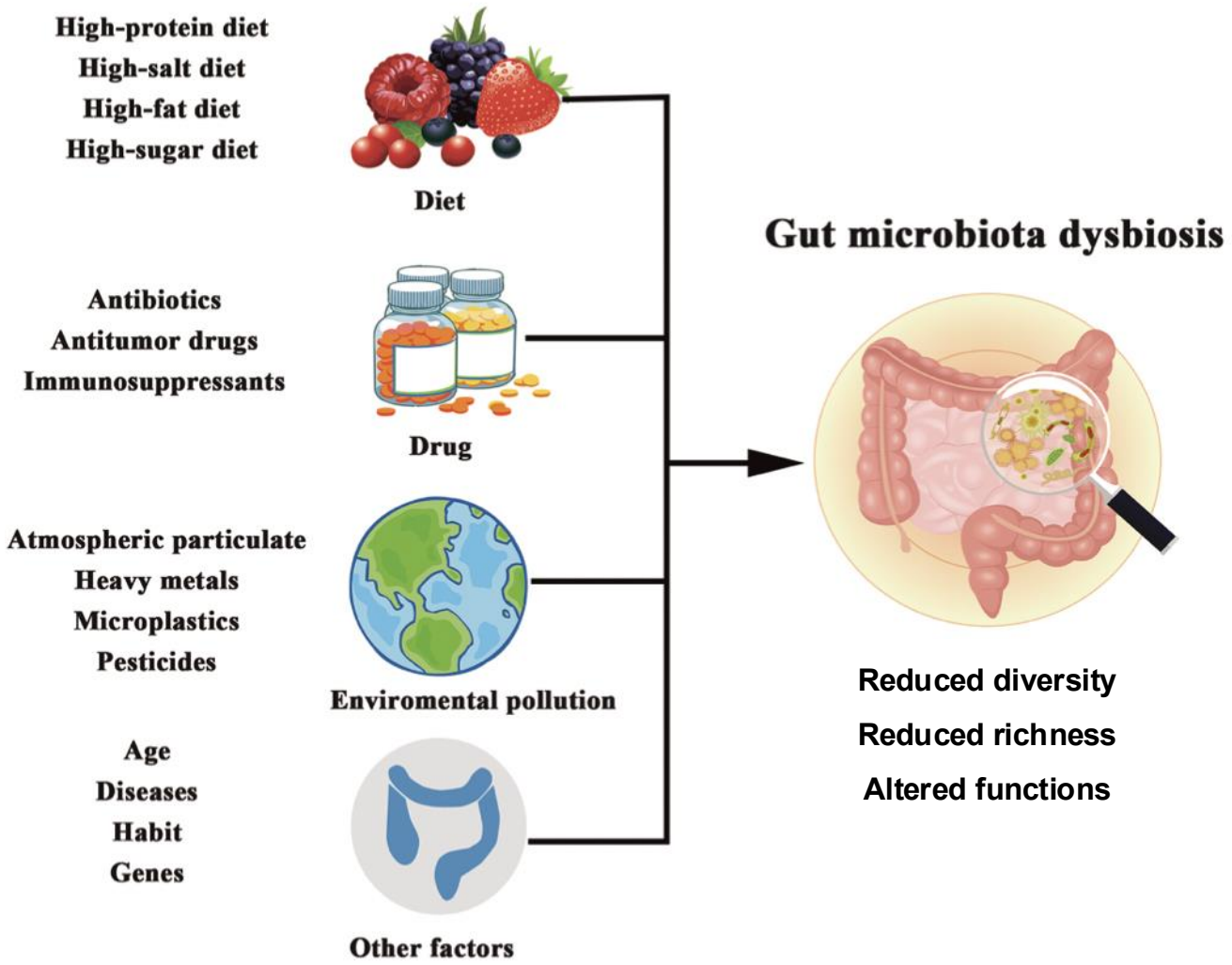
- **SCFAs prevent** accelerated **loss of the ovarian reserve**
- Dietary fiber **sustains oocyte quality** in high-fat diet conditions



Munyoki et al., 2025, Cell Host & Microbe *33*, 1731–1747
October 8, 2025

CAUSES OF DECREASED MICROBIOTA DIVERSITY

Several factors can **disrupt** the gut microbiota



Fusco et al., Nutrients 2023

ENDOCRINE DISRUPTING CHEMICALS

cells

MDPI

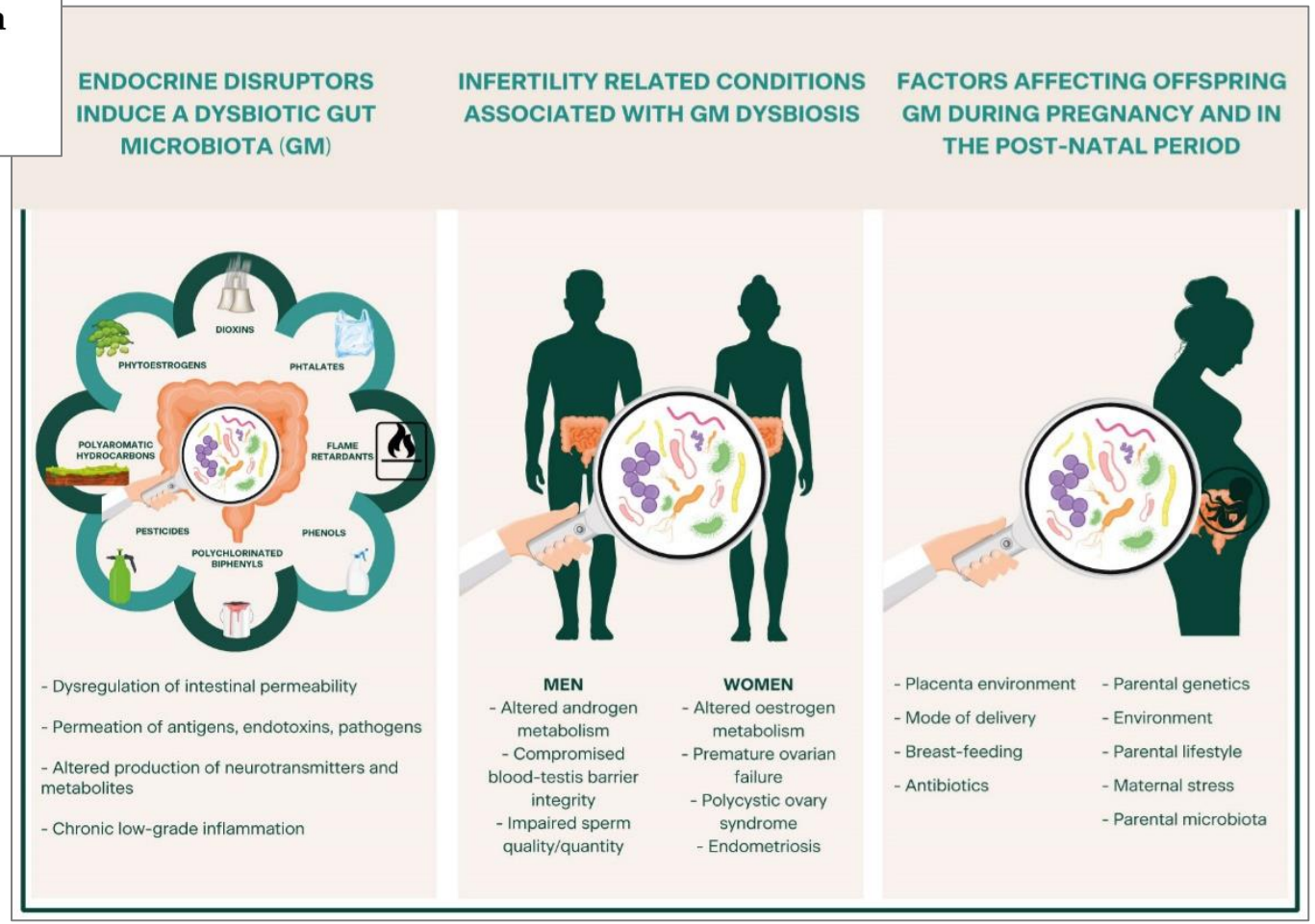
Perspective

Endocrine-Disrupting Chemicals, Gut Microbiota, and Human (In)Fertility—It Is Time to Consider the Triad

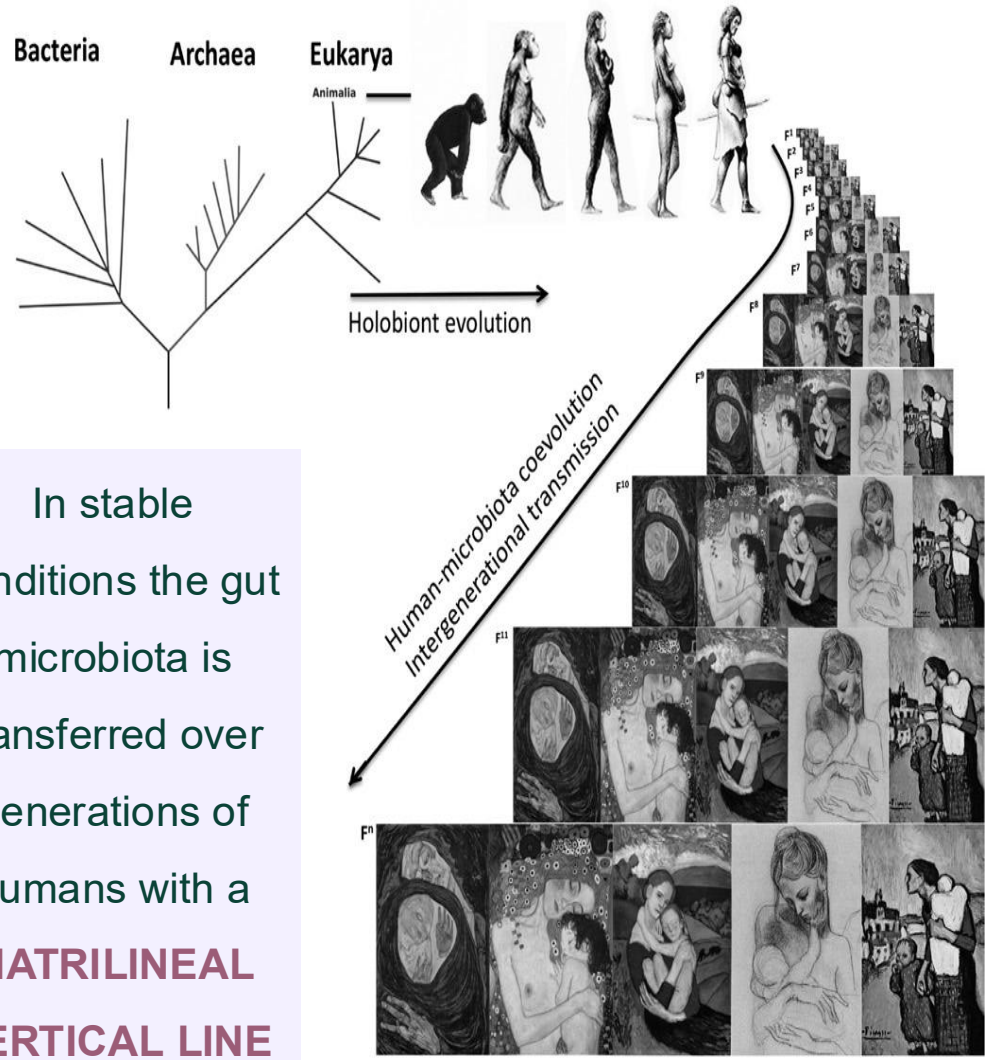
Gemma Fabozzi [1,2,*], Paola Rebuzzini [3], Danilo Cimadomo [2,*], Mariachiara Allori [1], Marica Franzago [4,5], Liborio Stuppia [4,6], Silvia Garagna [3,7], Filippo Maria Ubaldi [2], Maurizio Zuccotti [3,7,†] and Laura Rienzi [2,8,†]

Exposure to EDCs is one of the main causes of GM dysbiosis

This condition can lead, in turn, to an increased risk of occurrence of a range of infertility-related diseases in the exposed individual and in the offspring



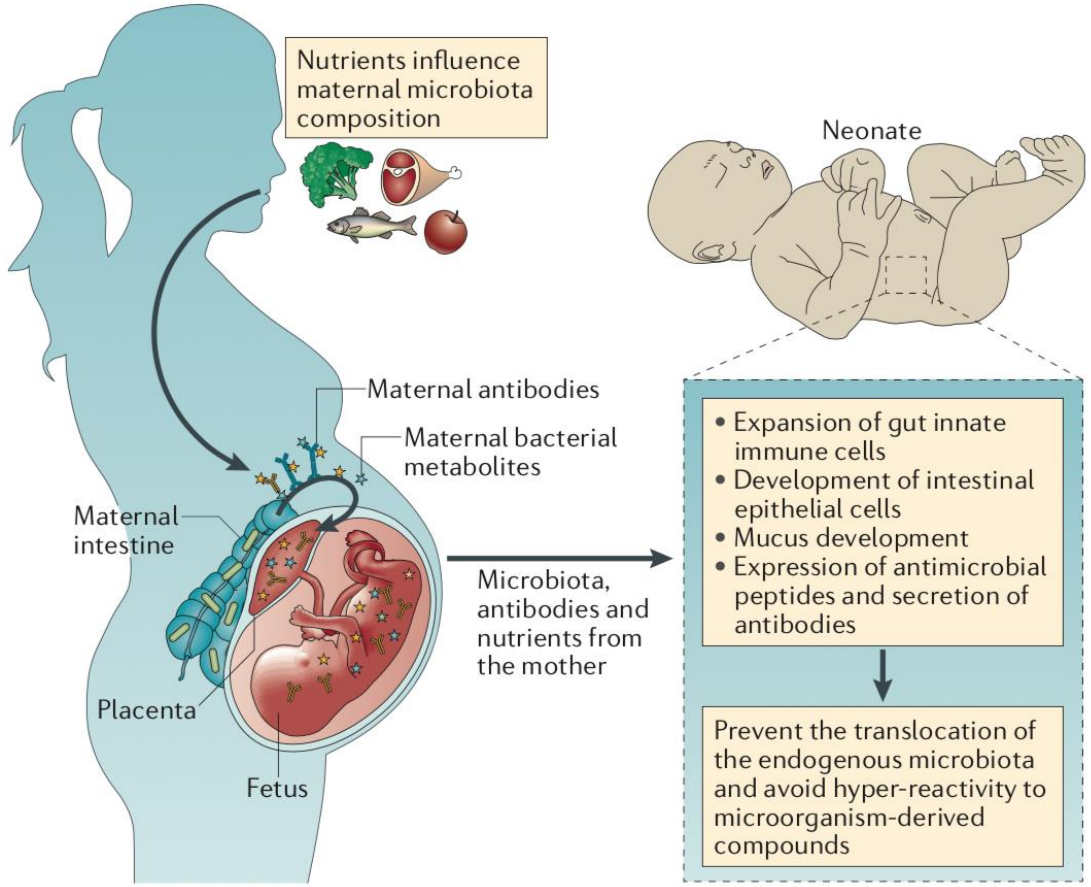
MATERNAL GUT MICROBIOTA SHAPES INFANT MICROBIOTA AND IMMUNE SYSTEM



In stable conditions the gut microbiota is transferred over generations of humans with a **MATRILINEAL VERTICAL LINE**

Dominguez-Bello MG, Gut, 2019

The mother microbiota influences the immune system in newborns



Andrew J - Nat Rev Immunol 2017

MATERNAL GUT MICROBIOTA SHAPES INFANT MICROBIOTA AND IMMUNE SYSTEM

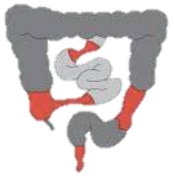
Decreased microbiome diversity leads to transient alteration of healthy microbiota that can drive to long-lasting effects, including **higher risk of IBD and overweight/obesity**

EARLY ANTIBIOTICS

MICROBIOTA DISRUPTION

Reduced diversity
Reduced richness
Delayed maturation
Altered functions

IMMUNE CHANGES →



+ 93% risk of **IBD**

Ortqvist et al – Gut 2019

Jess T- Sci Rep 2019
Ajslev TA- Int J Obes 2011

METABOLIC CHANGES →

+ 11%-57% risk of **OBESITY & OVERWEIGHT**

Rasmussen et al – Diab Obes Met 2018
Korpela et al – Microbiome 2017

GUT MICROBIOME AS AN EPIGENETIC MODULATOR

Current evidence supports a significant correlation between gut microbiota composition and epigenetic changes in genes relevant to **immunological**, **metabolic**, and **neurological** development and functions

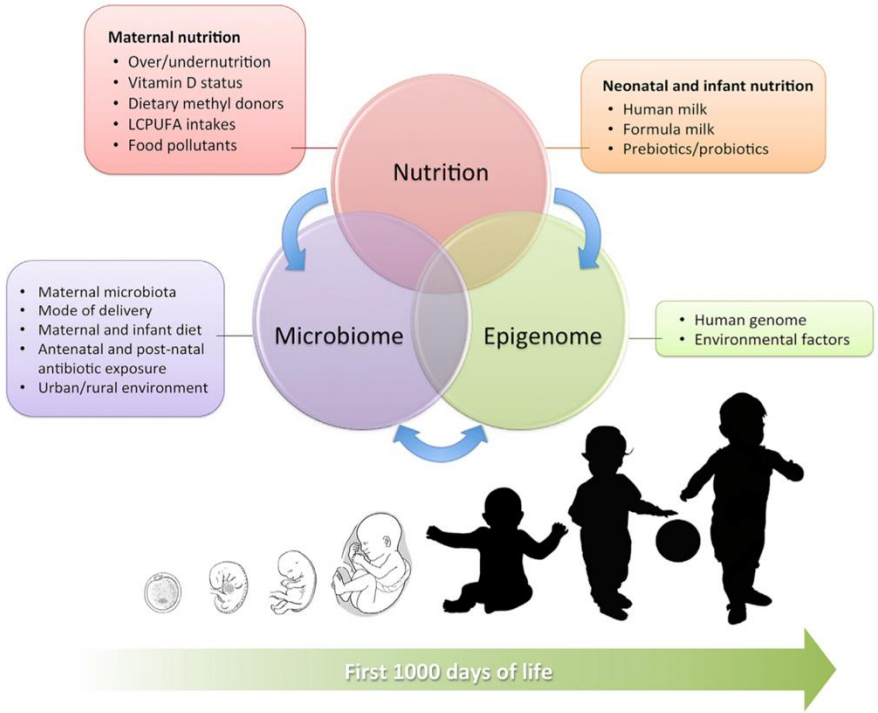


TABLE 3 | Epigenetic modifications associated with specific profiles of gut microbiota.

Strains	Epigenetic mechanism	Route	Clinical effects
Lactobacilli and *Bifidobacteria*	Butyrate-associated histone deacetylase (HDAC) inhibition	Nuclear factor-κB, peroxisome proliferator-activated receptor-γ, interferon-γ	Reduced intestinal and systemic inflammation (88, 104)
	Deoxyribonucleic acid (DNA) methylation secondary to methyl-donor production	Genes involved in inflammatory pathways	Modulation of intestinal and systemic inflammation (88)
Increased Firmicutes/ Bacteroidetes ratio	DNA methylation (CpG)	Toll-like receptor (TLR) 2 and TLR-4	Altered expression of pro-inflammatory genes Increased risk of type 2 diabetes mellitus (118)
	DNA methylation	SCD5 gene, encoding for a primate-specific stearoyl-coenzyme A desaturase	Altered catalysis of monounsaturated fatty acids from saturated fatty acids
		USF gene, involved in fatty acid synthase and in lipogenesis	Possibly increased risk of overweight, obesity and lipid metabolism disturbances (119)

Indrio et al., Front Pediatr. 2017

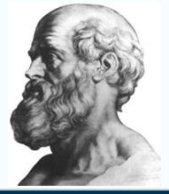
TAKE HOME MESSAGES

- Nutrition plays a pivotal role in reproductive health by modulating the **gut microbiota,** crucial for regulating inflammation and metabolic homeostasis.
- The "one-size-fits-all" approach mainly prevents deficiencies. **Tailored nutritional interventions**, guided by –**omics technologies**, enable more precise and effective outcomes.
- **Personalized dietary strategies** during the periconceptional period represent a powerful opportunity to **enhance reproductive success** and **promote long-term offspring health.**

THANK YOU FOR YOUR ATTENTION

All disease begins in the gut.

- Hippocrates -



*The diet-**gut** axis represents a cornerstone of **overall well-being***

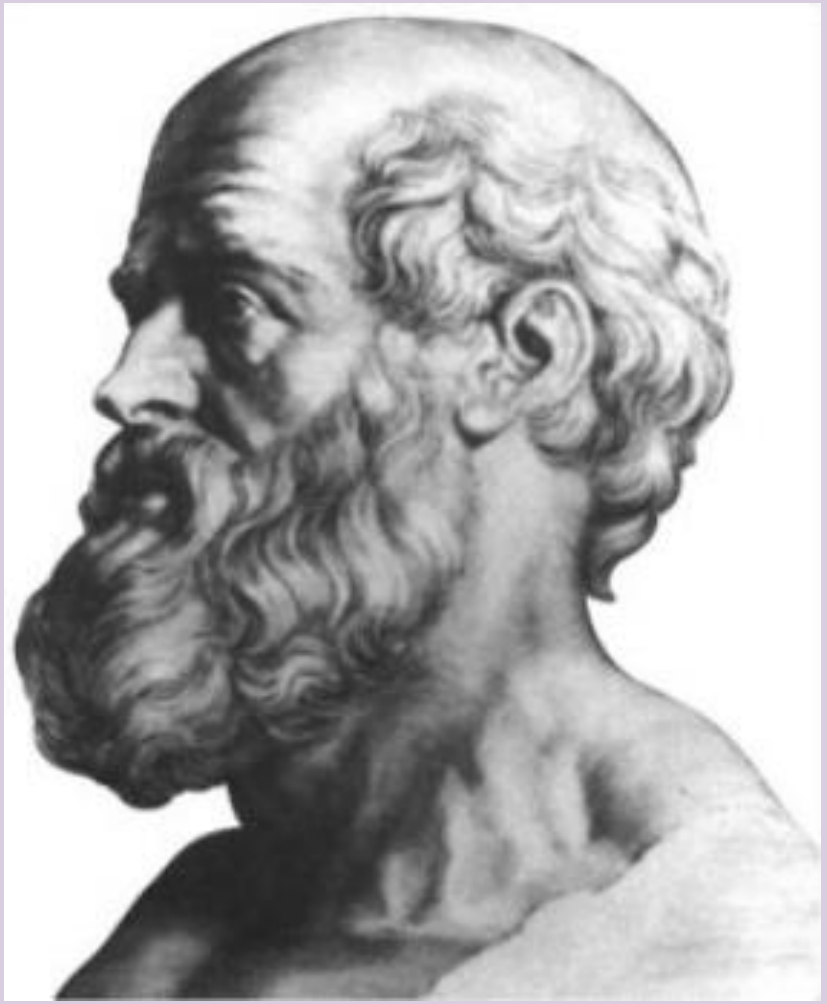
DIET PLAYS A KEY ROLE IN HEALTH AND DISEASE

«We are what we eat»

«Let food be thy medicine, and let medicine be thy food»

"If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have the safest way to health."

Hippocrates , Father of modern medicine , 2,500 years ago!



MECHANISMS LINKING DIET TO HEALTH AND DISEASE

Signal Transduction and Targeted Therapy

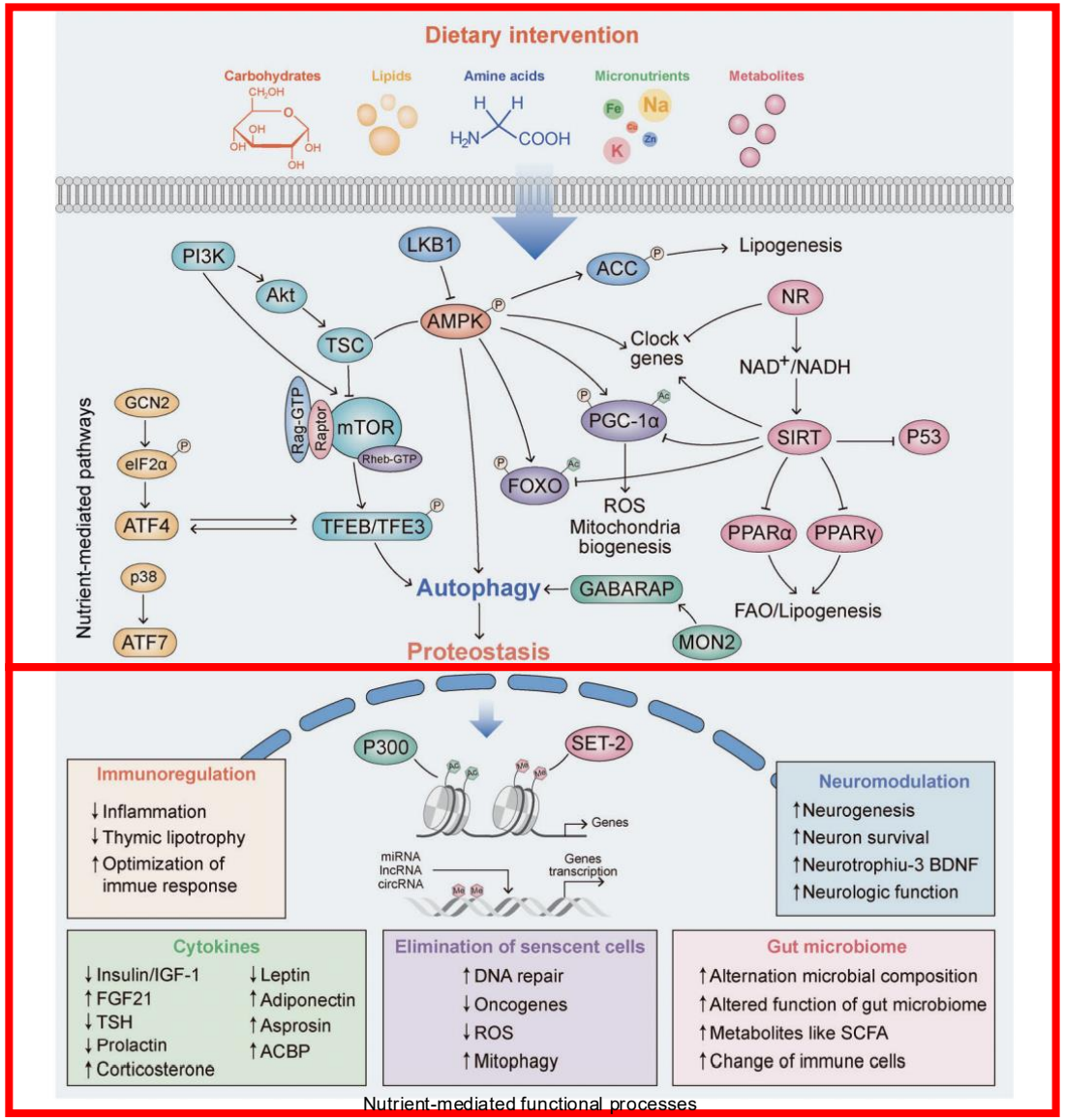
REVIEW ARTICLE OPEN

Dietary regulation in health and disease

Qi Wu[1], Zhi-Jie Gao[2], Xin Yu[2] and Ping Wang[1]✉

- **nutrient-mediated mechanisms:** metabolic regulators, nutrient metabolism pathways, epigenetic mechanisms and circadian clocks;

- **diet-responsive effectors:** diet-endocrine axis, the diet-immune axis, the diet-gut axis, the diet-senescence axis and the diet-nerve axis.



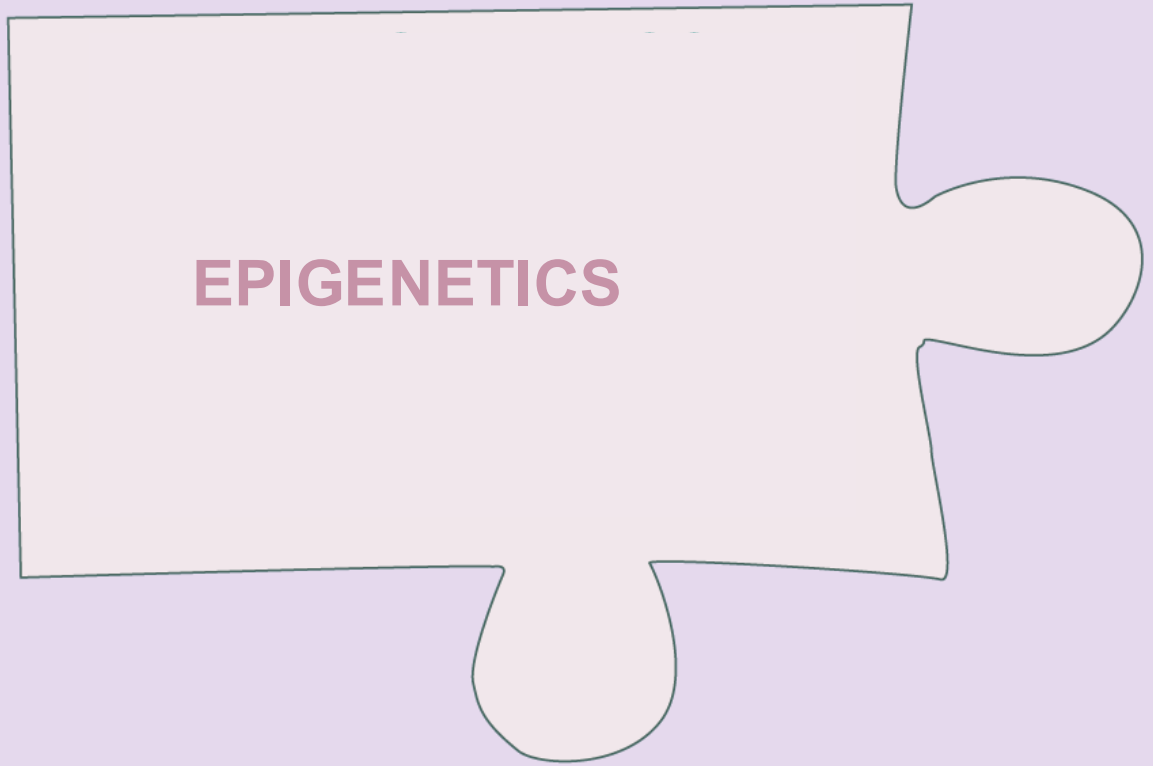
Nutrient-mediated functional processes

EPIGENETICS

Diet is one of the most **powerful environmental epigenetic factors**

Nutrients should not be considered just a source of energy.

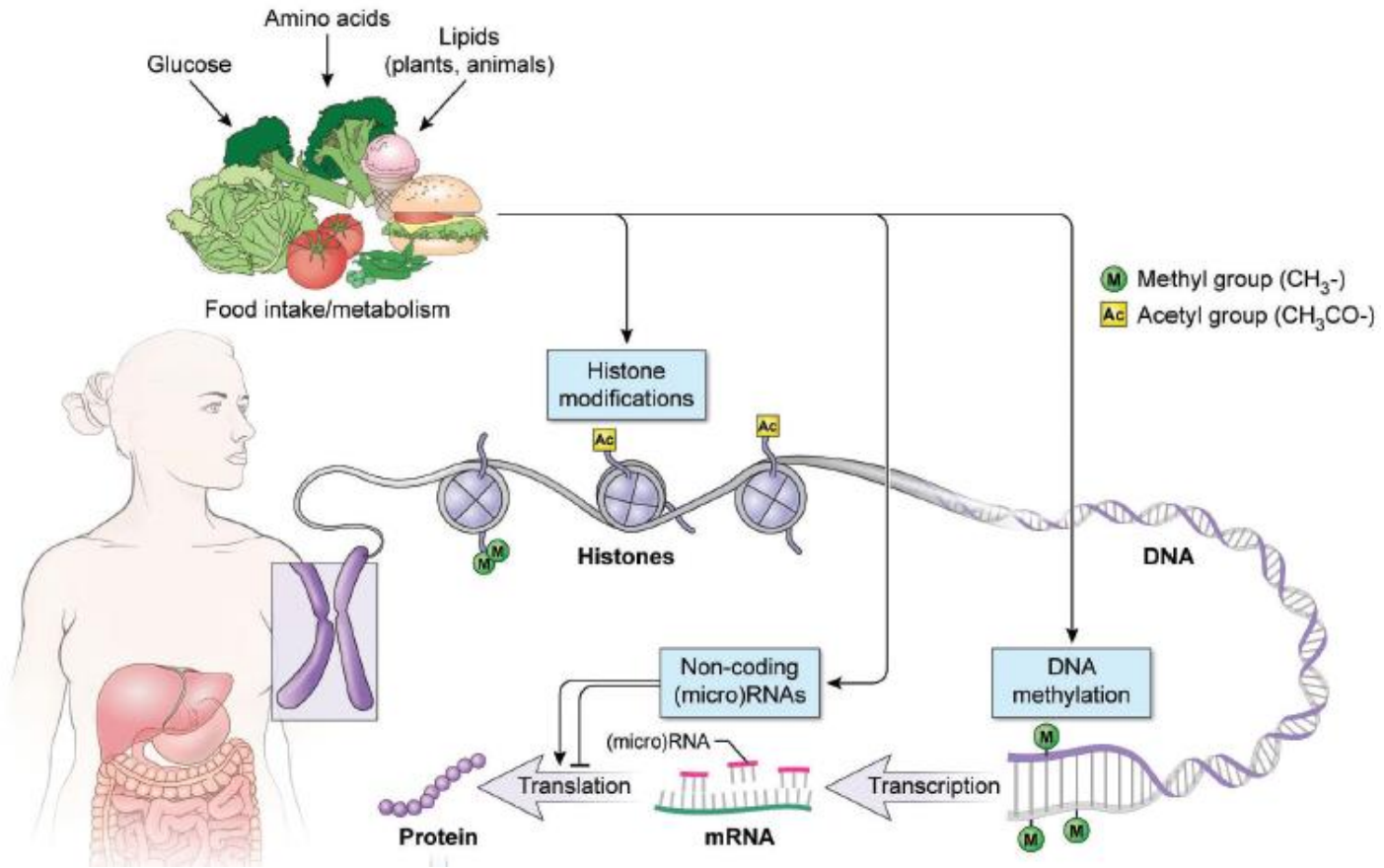
What we eat influences our genes.



NUTRITION AS ENVIRONMENTAL EPIGENETIC FACTOR

Nutrients are able to influence gene expression through:

- **DNA methylation** (gene silencing),
- **histone modifications**, mainly through acetylation (gene activation via increased access to chromatin),
- **post-transcriptional modifications** through RNA-dependent mechanisms



Nutrigenomic is the science studying the influence of nutrients on DNA

NUTRITION PLAYS A KEY MODULATORY ROLE OF INFLAMMATION

METABOLISM (M DALAMAGA, SECTION EDITOR)

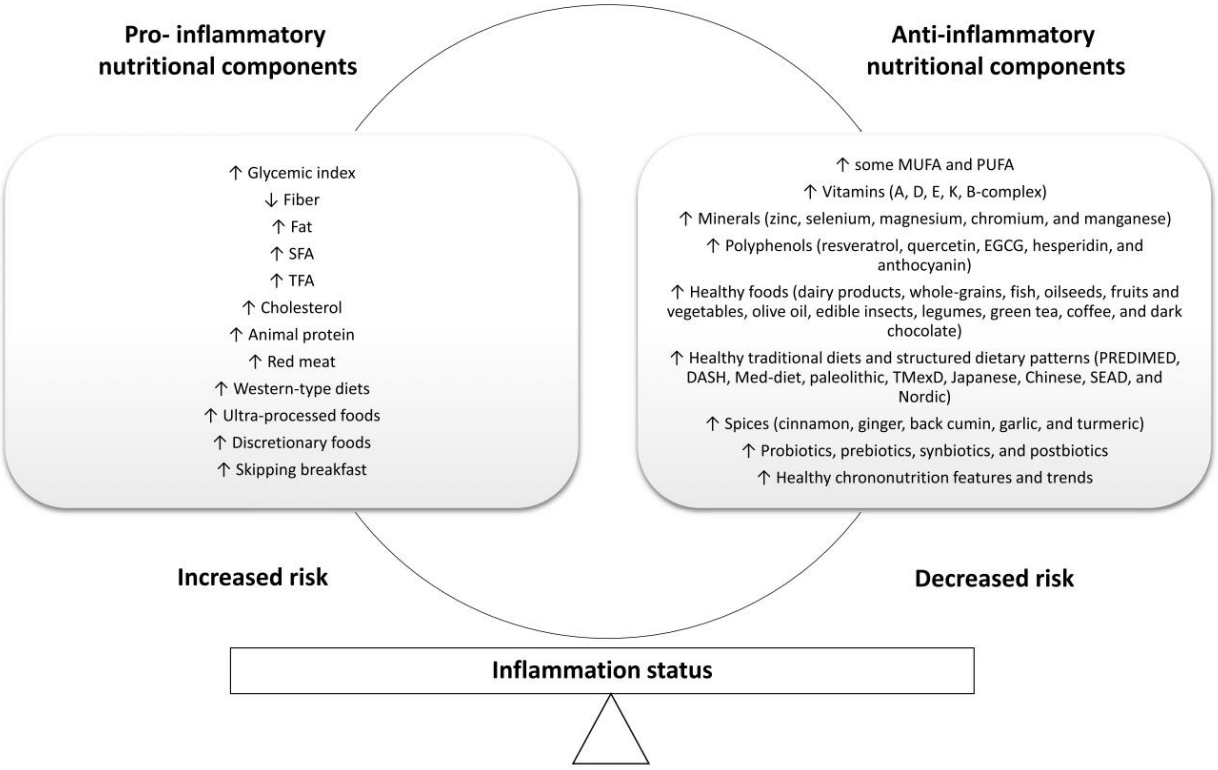
The Role of Nutrition on Meta-inflammation: Insights and Potential Targets in Communicable and Chronic Disease Management

Omar Ramos-Lopez[1] · Diego Martinez-Urbistondo[2] · Juan A. Vargas-Nuñez[3,4] · J. Alfredo Martinez[5,6,7]

Diet represents a valuable tool for modulating inflammatory balance **by simply combining specific nutritional components.**

Different nutritional factors exerts a deep effect on **inflammation** through **epigenetics** including:

- ✓ **macro-nutrients** (types of carbohydrates, protein sources, fatty acids)
- ✓ **Micro-nutrients** (vit.D, Iron, Zinc)
- ✓ **bioactive compounds** (polyphenols);
- ✓ **dietary patterns** (i.e., Western, Mediterranean)
- ✓ **common culinary ingredients** (species and herbs);
- ✓ **chrononutrition features**



OLIVE OIL

molecules MDPI

Review

Epigenetic Modifications Induced by Olive Oil and Its Phenolic Compounds: A Systematic Review

Roberto Fabiani *, Nicolò Vella and Patrizia Rosignoli

Extra virgin olive oil and its phenolic compounds can influence gene expression at multiple levels

✓ miRNAs expression

Olive oil/Extra virgin olive oil
***Olea europaea* leaves phenolic extract**
Hydroxytyrosol, Oleuropein
Oleacein, Oleocanthal
Hydroxytyrosol oleate
Hydroxytyrosol-3-O-sulphate

Anti-oxidant
- ↑miRNA-34a
- ↑miRNA-21
- ↑miRNA-29a
- ↓Up-regulation of miRNA-9 induced by H_2O_2
- ↑Methylation of miRNA-9 promoters decreased by H_2O_2

Anti-cancer effects
- ↑miRNA-584
- ↑miRNA-210
- ↑miRNA-181b
- ↑miRNA-145
- ↑miRNA-137
- ↑miRNA-153
- ↑Let-7d
- ↑miRNA-299
- ↑miRNA-29b
- ↑miRNA-22
- ↑miRNA-219-1-3b
- ↓miRNA-24
- ↓miRNA-23
- ↓miRNA-301a
- ↓miRNA-21
- ↓miRNA-155

Anti-inflammatory effects
- ↓miRNA-34a
- ↓miRNA-155
- ↓miRNA-34a-5p
- ↓miRNA-155-5p — Induced by TNF-α
- ↓miRNA-146a — Induced by LPS
- ↑let-7c
- ↑let-7c-5p
- ↑let-7 — Decreased by TNF-α/IL-1β

Anti-Alzheimer disease Anti-aging
- ↑miRNA-484
- ↑miRNA-27
- ↑miRNA-137
- ↑miRNA-30
- ↑miRNA-34
- ↑miRNA-124

✓ DNA methylation

Olive oil/Extra virgin olive oil
***Olea europaea* leaves phenolic extract**
Hydroxytyrosol, Oleacein

Anti-obesity
- ↑VEGFB promoter methylation versus CO

Anti-cancer effects
- ↑Global DNA methylation
- ↑mRNA expression *Mbd1*
- ↑MGMT promoter methylation
- ↓*RASSF1A, TIMP3, CNR1* promoter methylation
- ↓mRNA of *DNMT1, DNMT3a DNMT3b*
- ↓DNMT, DNMT1, 3A/3L and 3B/3L activity
- ↓miR-143, miR-145, caspase-3, caspase-9 promoter methylation

Anti-inflammatory effects
- ↑NF-κB, VEGF, MMP-9 promoter methylation
- ↑TNFα promoter methylation versus CO
- ↑Global DNA methylation versus NG
- ↓TNFα promoter methylation versus SO
- ↓mRNA of *DNMT1,* DNMT3A, DNMT3B
- ↓Methylation of IL6
- ↓TET2

Anti-oxidant
- ↑*TR* and *ND4L* mitochondrial DNA methylation
- ↑DNMT3A, HIF1a mRNA and protein
- ↑Methylation of miRNA-9 promoters decreased by H_2O_2
- ↓*RNR1* mitochondrial DNA methylation
- ↓DNMT1, DNMT3B mRNA and protein

✓ histone modification

Olive oil/Extra virgin olive oil
EVOO phenolic extract
Hydroxytyrosol, Oleuropein, Oleacein

Anti-diabetes
- ↑HDAC6
- ↓KDM1A (LSD1)

Anti-cancer effects
- ↑Acetylation of Histone H3 at Lysine 18
- ↑ H3 and H4 acetylation
- ↓H4K20me3
- ↓H4K16ac, H3K9me3
- ↓HDAC2, HDAC3, HDAC4 mRNA
- ↓I/II HDACs (HDAC1/2/3/4/6)
- ↓KDM1A (LSD1)
- ↓KDM6A
- ↓DOT1L

Anti-Alzheimer disease
- ↑H3K9 and H4K5 acetylation
- ↓HDAC2, HDAC6 expression

Anti-inflammatory effects
- ↓HDAC1, HDAC3

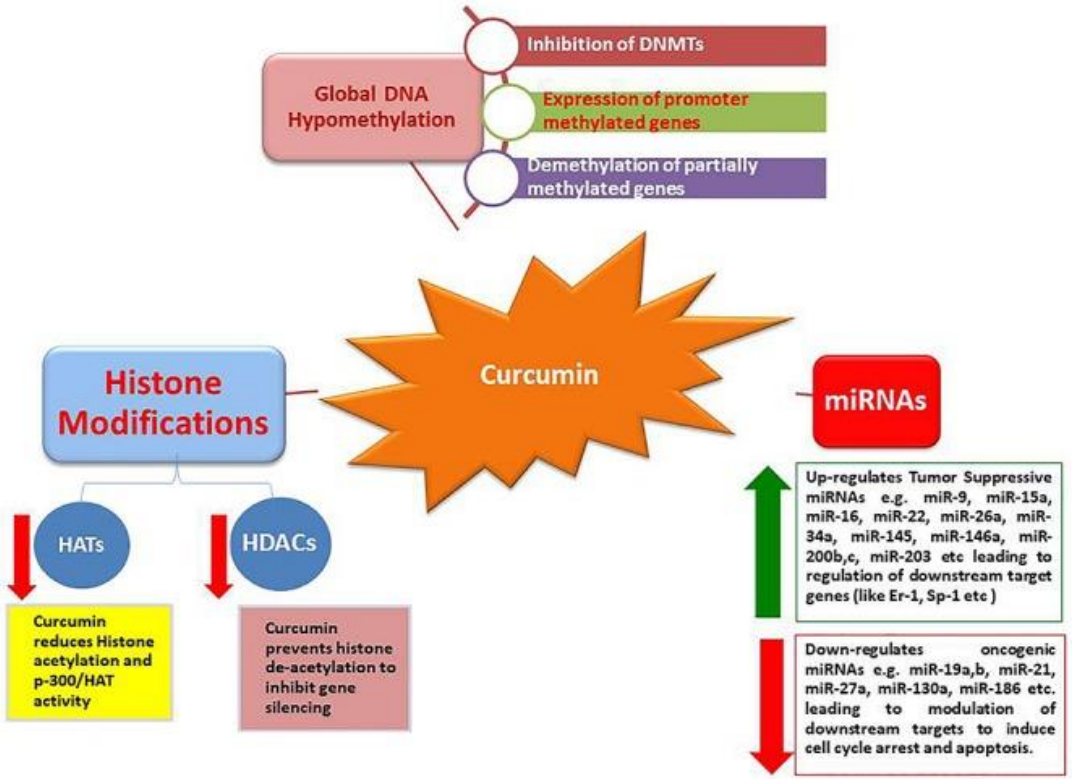
CURCUMIN

Curcumin, the main bioactive compound in turmeric, is an epigenetic inactivator for genes involved in chronic diseases, including cancer.

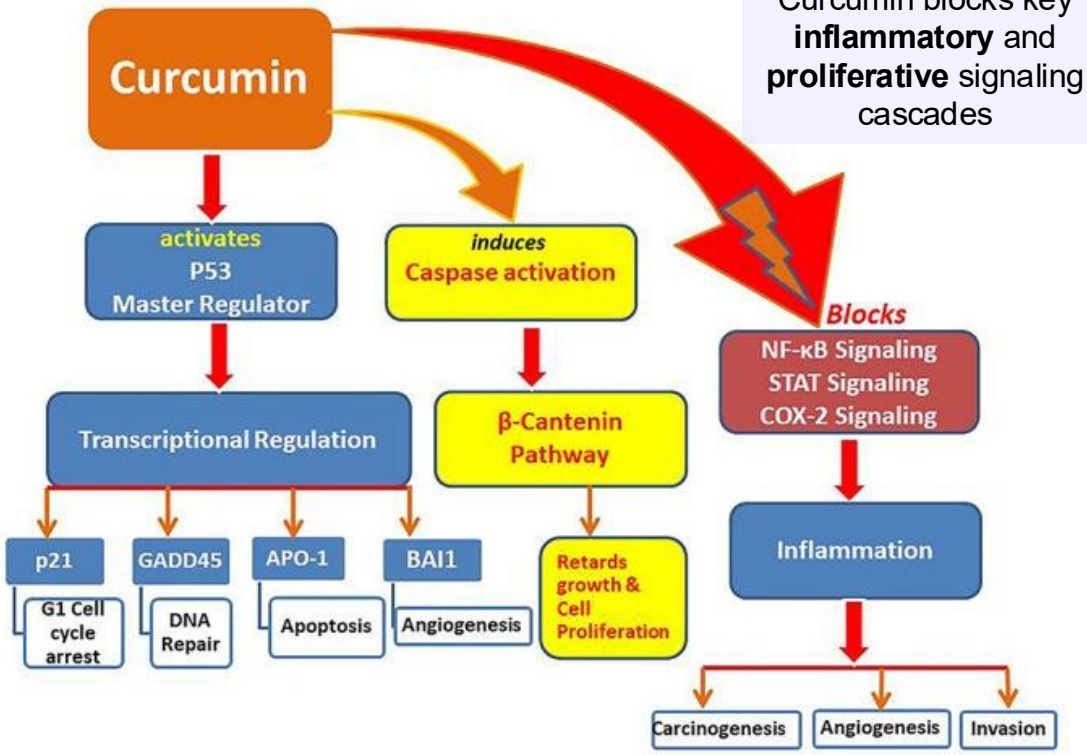
frontiers in Genetics
REVIEW
published: 04 June 2019
doi: 10.3389/fgene.2019.00514

Curcumin as an Alternative Epigenetic Modulator: Mechanism of Action and Potential Effects

Faiz-ul Hassan[1,2], Muhammad Saif-ur Rehman[2], Muhammad Sajjad Khan[2], Muhammad Amjad Ali[2], Aroosa Javed[4], Ayesha Nawaz[4] and Chengjian Yang[1]



Curcumin blocks key **inflammatory** and **proliferative** signaling cascades



FATTY ACIDS, EPIGENETICS MECHANISMS AND DISEASES

González-Becerra et al. Lipids in Health and Disease (2019) 18:178
https://doi.org/10.1186/s12944-019-1120-6

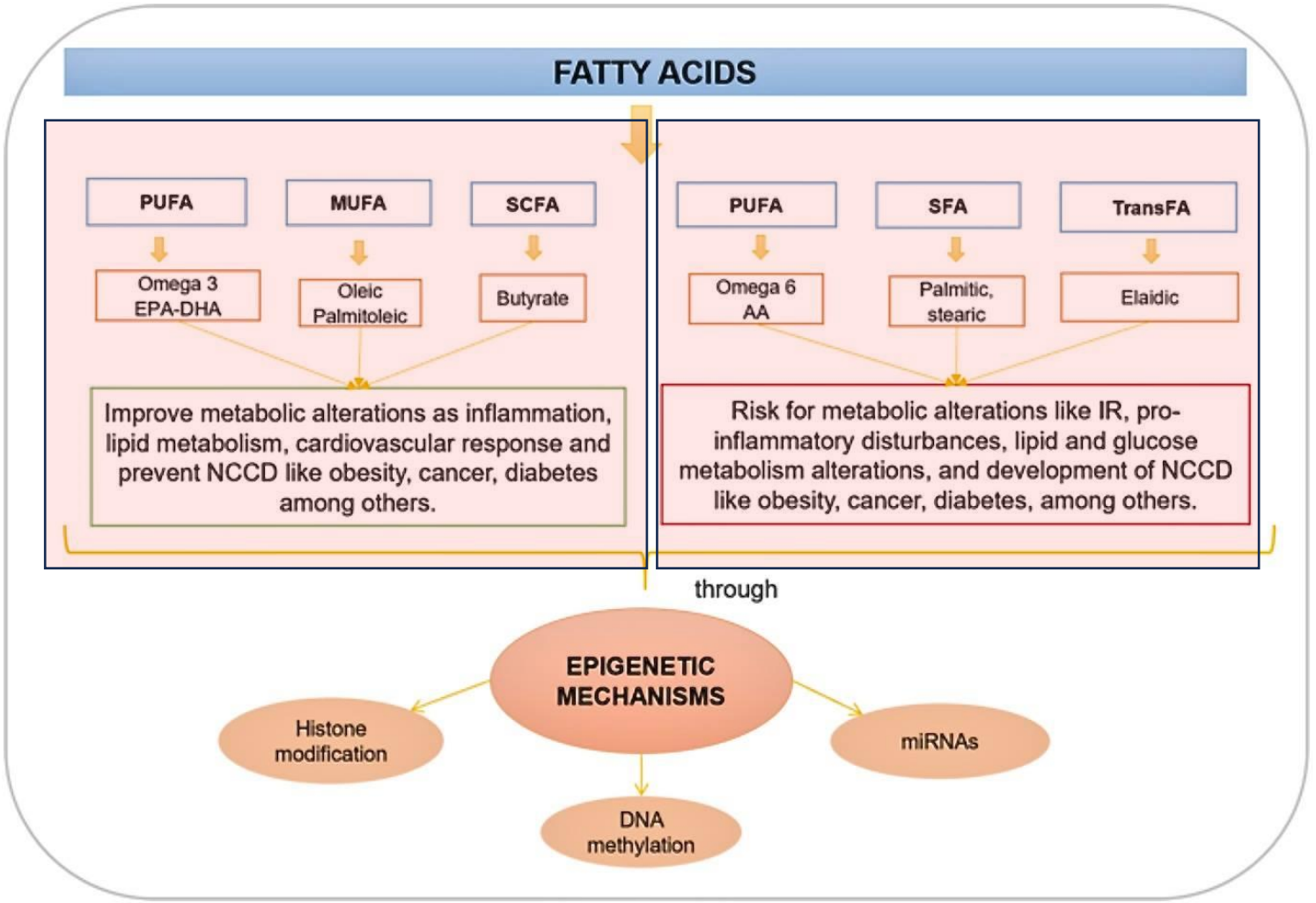
Lipids in Health and Disease

REVIEW Open Access

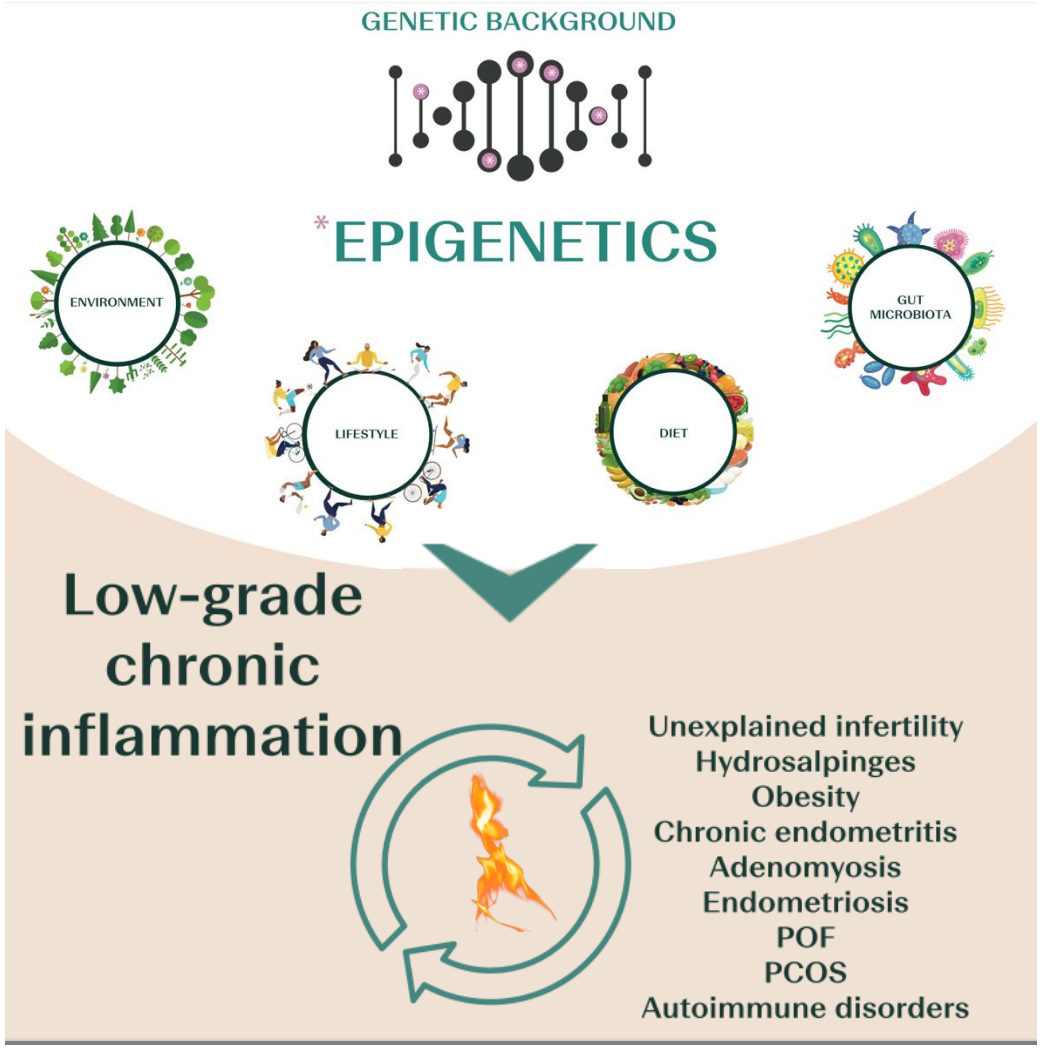
Fatty acids, epigenetic mechanisms and chronic diseases: a systematic review

K. González-Becerra[1], O. Ramos-Lopez[2,3], E. Barrón-Cabrera[1], J. I. Riezu-Boj[2,4], F. I. Milagro[2,4,5], E. Martínez-López[1,6*] and J. A. Martínez[2,4,5,7]

Fatty Acids, **depending on their structure**, can regulate gene expression through epigenetic mechanisms, **resulting in positive or negative impacts** on metabolic outcomes



INFLAMMATION AND INFERTILITY



NUTRITION RESEARCH 125 (2024) 50–60

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Original Research

High Dietary Inflammatory Index increases the risk of female infertility: An analysis of NHANES 2013-2018

Huanying Xu[a,b,#], *Qidan Wen*[a,#], *Xiaoyan Xing*[a], *Yu Chen*[b], *Qiaoling Zhu*[b], *Minhua Tan*[b], *Miaomiao Zhang*[b], *Ting Pan*[b], *Suzhen Wu*[a,b,*]

[a] Foshan Clinical Medical School of Guangzhou University of Chinese Medicine, Chanchen
[b] TCM Gynecology Department, Foshan Fosun Chancheng Hospital, Chancheng District, F

2613 women
aged 20 to 45y

Table 3 – Dose-effect analysis of the relationship between DII and odds ratio (95% CI) of infertile women from the 2013–2018 NHANES analyzed by weighted logistic regression.

Outcome	OR (95% CI)	P value
One-line linear regression model	1.06 (0.96–1.19)	.23
Two piece-wise linear regression model		
DII < 2.45	1.03 (0.88–1.21)	.70
DII ≥ 2.45	1.95 (1.49–2.54)	<.0001
Log-likelihood ratio test	<.05	

Abbreviations: 95% CI, confidence interval; DII, dietary inflammatory index; NHANES, National Health and Nutrition Examination Survey; OR, odds ratios.
Model was adjusted for age, body mass index, race, marital status, education level, smoking status, consuming alcohol status, income to poverty ratio, pelvic inflammatory disease, age of menarche.

PERSONALIZED NUTRITIONAL SUPPORT FOR INFERTILE PATIENTS

nutrients MDPI

Review

Personalized Nutrition in the Management of Female Infertility: New Insights on Chronic Low-Grade Inflammation

Gemma Fabozzi [1,2,*], Giulia Verdone [1], Mariachiara Allori [1], Danilo Cimadomo [2], Carla Tatone [3], Liborio Stuppia [4,5], Marica Franzago [4,6], Nicolò Ubaldi [7], Alberto Vaiarelli [2], Filippo Maria Ubaldi [2], Laura Rienzi [2,8] and Gianluca Gennarelli [9]

A targeted personalized "**anti-inflammatory**" nutritional support for infertile patients during the "fertility journey" represents valuable tool **to lower the pro-inflammatory status** that characterizes different infertility related diseases

Omics sciences can help us build a more **precise and integrative anti-inflammatory approach**.

NUTRIGENETICS

Analysis for gene variants specific metabolic pathways e.g:
MTHFR
FADS 1
PPAR- γ
CYP1A2
Adopting nutritional strategies to counteract related deficiencies

NUTRIGENOMICS

Use of dietary compounds with epigenetic anti-inflammatory properties e.g.:
Dietary Fatty Acids
MUFA (EVOO)
PUFA (wild salmon)
Spices
Curcumin (turmeric)
Gingerols (ginger)
Capsaicin (chili pepper)

METABOLOMICS

Assessment of gut barrier status analysing metabolites e.g. :
Skatole (urine)
Indican (urine)
Calprotectin (feces)
Zonulin (feces)

MICROBIOMICS

Assessment of gut eubiosis analysing microbiota diversity e.g. :
Firmicutes/Bacteroidetes ratio
Lactobacillus dominance
Adopting nutritional strategies to restore gut barrier integrity e.g.:
fermented foods
Vitamin D supplementation

FROM MATERNAL DIET....TO NEURODEVELOPMENTAL DISORDERS

frontiers in Cellular Neuroscience

REVIEW
published: 15 January 2021
doi: 10.3389/fncel.2020.612705

From Maternal Diet to Neurodevelopmental Disorders: A Story of Neuroinflammation

*Maude Bordeleau[1,2], Lourdes Fernández de Cossío[3], M. Mallar Chakravarty[1,4,5,6] and Marie-Ève Tremblay[2,7,8,9,10]**

A balanced diet regulates **transport across the placenta**, and **fetal growth**, **development** and **long-term health.**

An imbalanced diet affect the maternal-fetal environment influencing in the offspring:

- ✓ genetic programming
- ✓ neuroinflammation
- ✓ gut microbiome endotoxicity