Hormones Gone Haywire
Why you should be testing BPA

Charlotte Hunter
KBMO Diagnostics UK

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Overview

- Meet the Team
- What is BPA, where is it found, and why it matters
- Impact of BPA on health
- Testing BPA and the HIT (Hormone Insights Test)
- BPA in practice

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Meet the Team

Charlotte Hunter
Head of KBMO UK

Linette Petrillo
Customer Services

Kelly Hutson
Business Relationships

Clare Kennedy
Operations Manager

Natasha Khan
Practitioner Relationships

Emily Birch
Communications & Support

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What is BPA?
Where is it Found?
Why Does it Matter?

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What is Bisphenol A (BPA)?

- Synthetic compound: 2,2-bis(4-hydroxyphenyl)propane
- Used in polycarbonate plastics & epoxy resins
- Lipophilic phenolic structure → mimics 17β-estradiol
- Classified as an endocrine-disrupting chemical (EDC)

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UK Regulations

- UK banned BPA in baby bottles for infants in 2011.
- In UK food-contact materials, BPA may be used only if migration ≤ 0.05 mg/kg of food.
- Unlike the EU, the UK has not yet implemented a full ban on BPA in all food-contact materials.
- UK regulatory body Food Standards Agency (FSA) uses a much higher tolerable daily intake (TDI) for BPA than the European Food Safety Authority (EFSA) (UK TDI ~1000× less strict).
- UK government is considering updating current BPA restrictions and including analogues.

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BPA in Everyday Life

- Key raw material for polycarbonate plastics and epoxy resins → BPA analogues (BPS, BPF) used widely in “BPA-free” materials
- Found in food & drink packaging, storage containers, bottle and can linings, children’s toys, thermal till receipts, automotive parts, building materials, electrical coatings, dental sealants.
- Leaches easily from products into food, dust, and the environment
- Exposure routes → oral, dermal, inhalation
- Detected in multiple biological samples: urine, blood, milk, placenta, amniotic fluid, hair, sweat, saliva

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Routes of Exposure

- Heat, acidity, and wear ↑ BPA migration
- **Epoxy resins** → used in tin can linings, water pipes, dental sealants
- **Thermal paper receipts** → high levels of free BPA → rapid dermal absorption
- **Dust & indoor air** → microplastics act as BPA carriers → inhalation & ingestion
- **Occupational exposure** → retail workers, healthcare staff, thermal paper handling
- **Environmental ubiquity** → found in soil, sediments, and drinking water
- Human biomonitoring: BPA detected in ~90% of US (NHANES) and European populations
- Present in urine, serum, breast milk, amniotic fluid, and placenta

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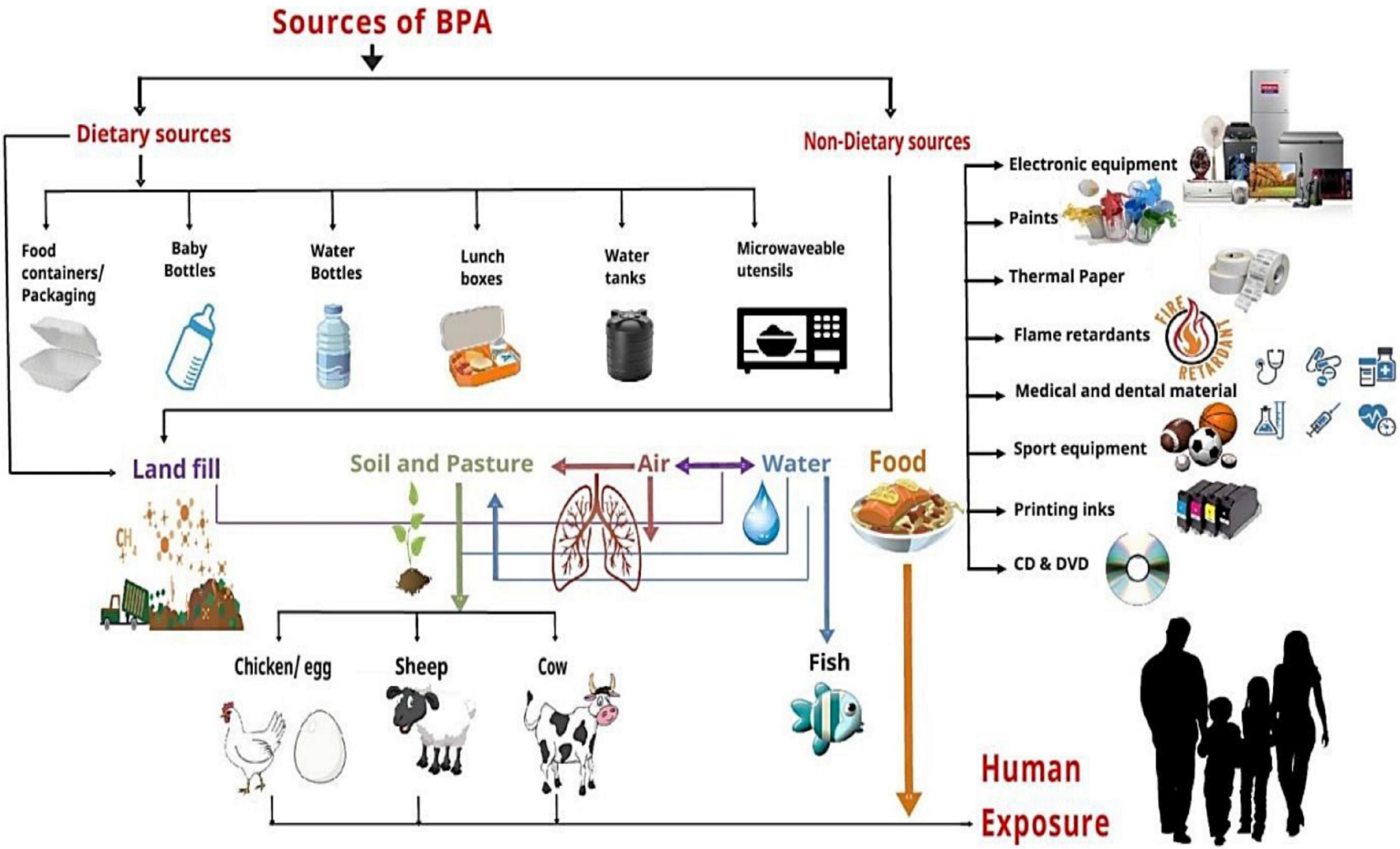

(Manzoor et al., 2022)

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Migration from Packaging to Food

- Migration = complex, multi-factor process
- Influenced by food composition, fat content, contact time, temperature, and polymer type
- Fat-rich foods ↑ BPA migration — lipophilic compounds dissolve BPA more readily
- Migration rate ∝ √contact time — longer storage → higher leaching
- High temperature = major driver
- Heating, boiling, microwaving ↑ BPA release up to 55-fold vs 20 °C
- Incomplete polymerisation of epoxy resins & PVC coatings → monomer residues leach during heating and storage
- Canned foods = major dietary source → BPA in 73 % of canned vs 7 % of non-canned foods
- Estimated adult intake ≈ 12.6 ng/kg/day — >95 % from canned coatings
- Infant exposure: higher in polycarbonate (PC) bottle users than breastfed or non-PC fed infants

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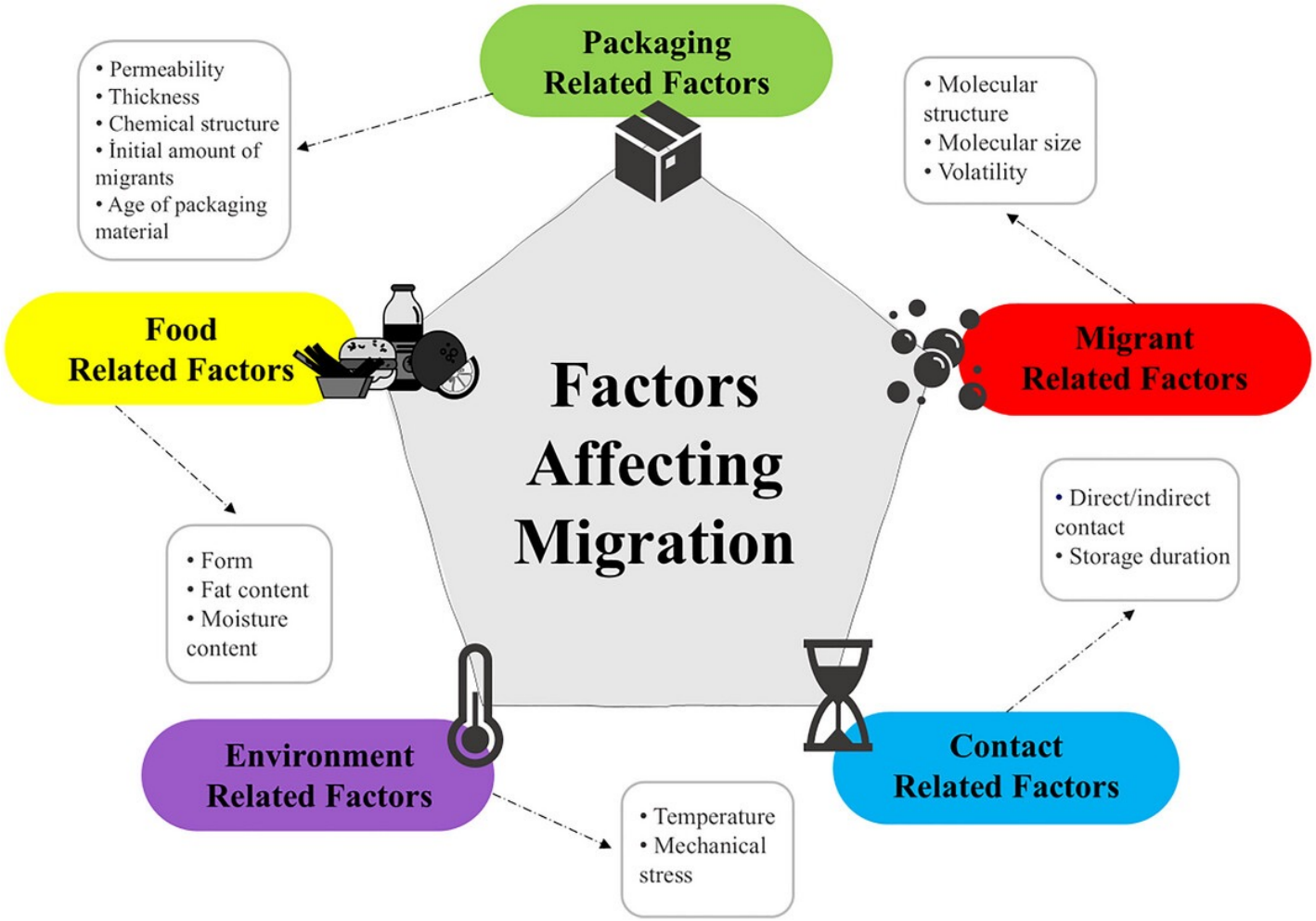

(Seref and Cufaoglu, 2025)

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Metabolism of BPA

- Rapidly metabolised in the liver and gut
- Mainly converted to BPA-glucuronide (BPA-G) and BPA-sulphate (BPA-S)
- Excreted in urine – half-life ≈ 2 hours
- β-glucuronidase can convert conjugated BPA back to free BPA
- Fat-soluble: stored in adipose tissue and released slowly
- Found in adipose, liver, brain, and breast milk
- Conjugated BPA = mostly inactive at receptors, but may signal via membrane ERα
- Total urinary BPA (free + conjugated) = best biomarker of exposure
- Small amounts of free BPA found in blood → evidence of ongoing tissue release

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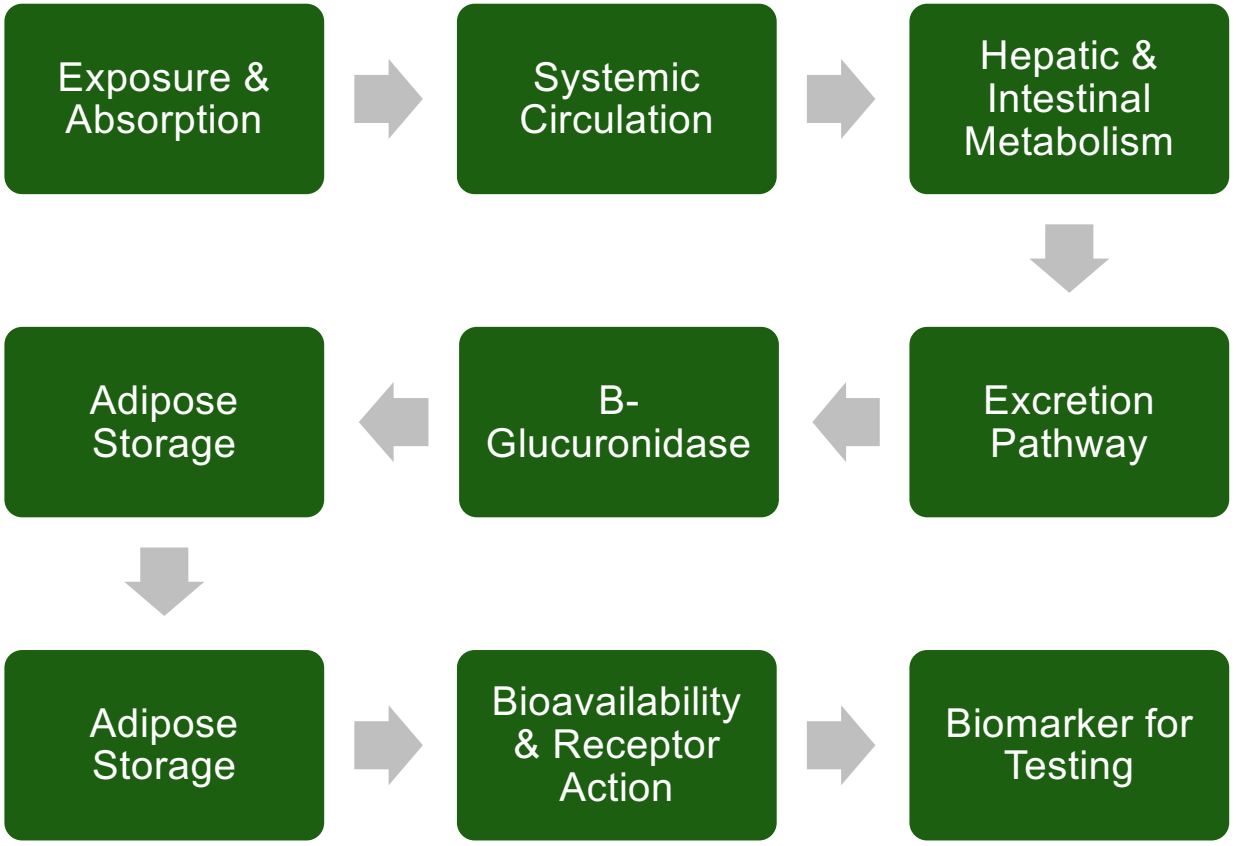
BPA Absorption, Conjugation, and Excretion



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Impact of BPA on Health

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Endocrine Disruption

- Alters hormone synthesis, secretion & transport → displaces hormones from binding proteins → changes free hormone levels
- Disrupts pituitary feedback loops → ↑ FSH/LH (PCOS-like pattern)
- Anti-androgenic → ↓ testosterone
- Thyroid interference → blocks T3-mediated transcription
- Neuroendocrine effects → ↓ DHEA, mood & cognitive changes

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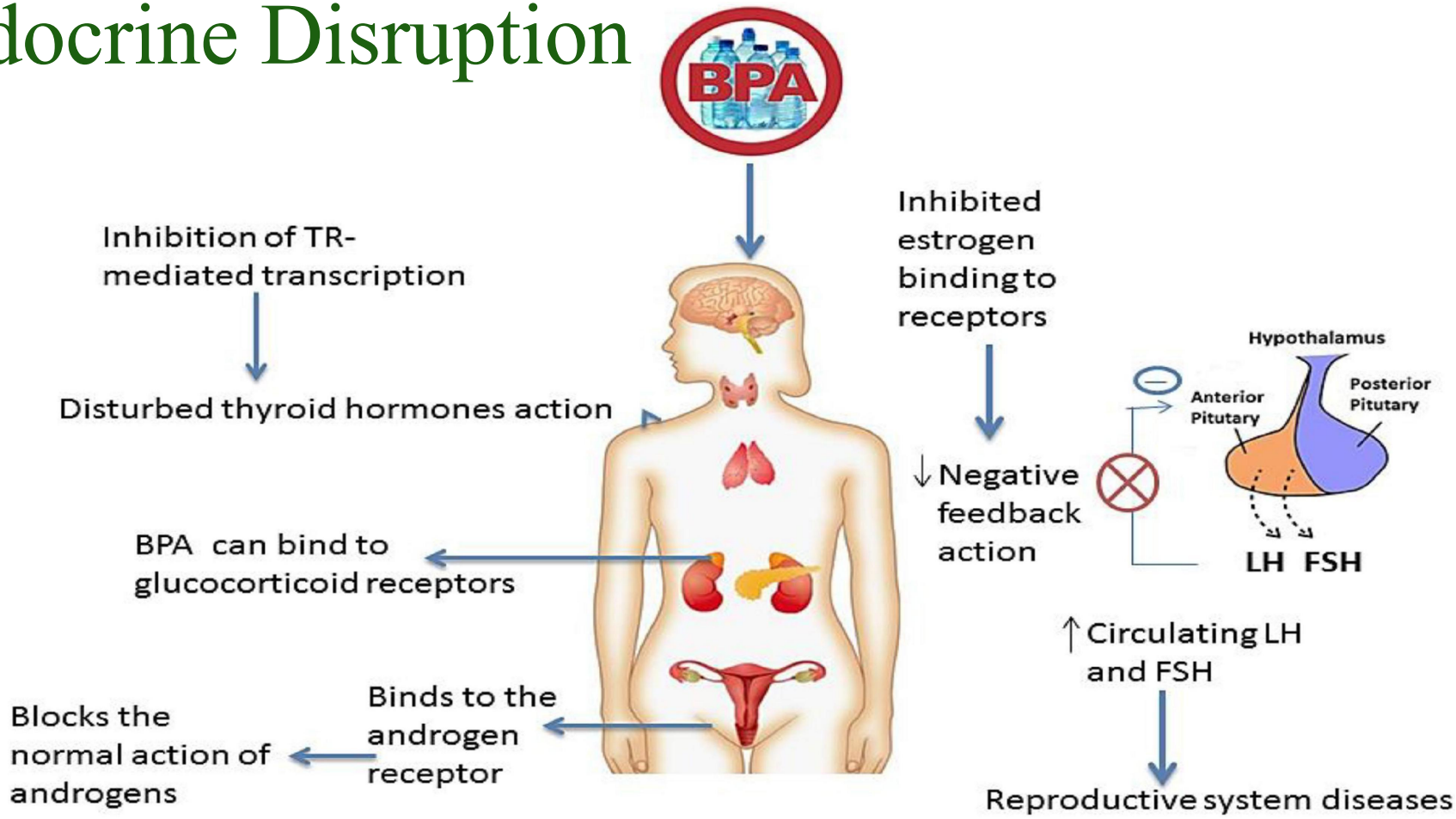
Endocrine Disruption



(Manzoor et al., 2022)

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Reproductive Effects of BPA

- Highly sensitive target: reproductive system most affected by BPA
- Disrupts sex hormone balance → alters LH, FSH, E2, progesterone, and testosterone
- Linked to:

- ↑ LH & estradiol, ↑ testosterone, ↓ cortisol
- Altered endometrial thickness and cycle regularity
- **PCOS:** ↑ BPA levels vs. controls; associated with hyperandrogenism
- **Pregnancy outcomes:** miscarriage, preterm birth, implantation failure
- **Male fertility:** reduced sperm count & quality, sexual dysfunction

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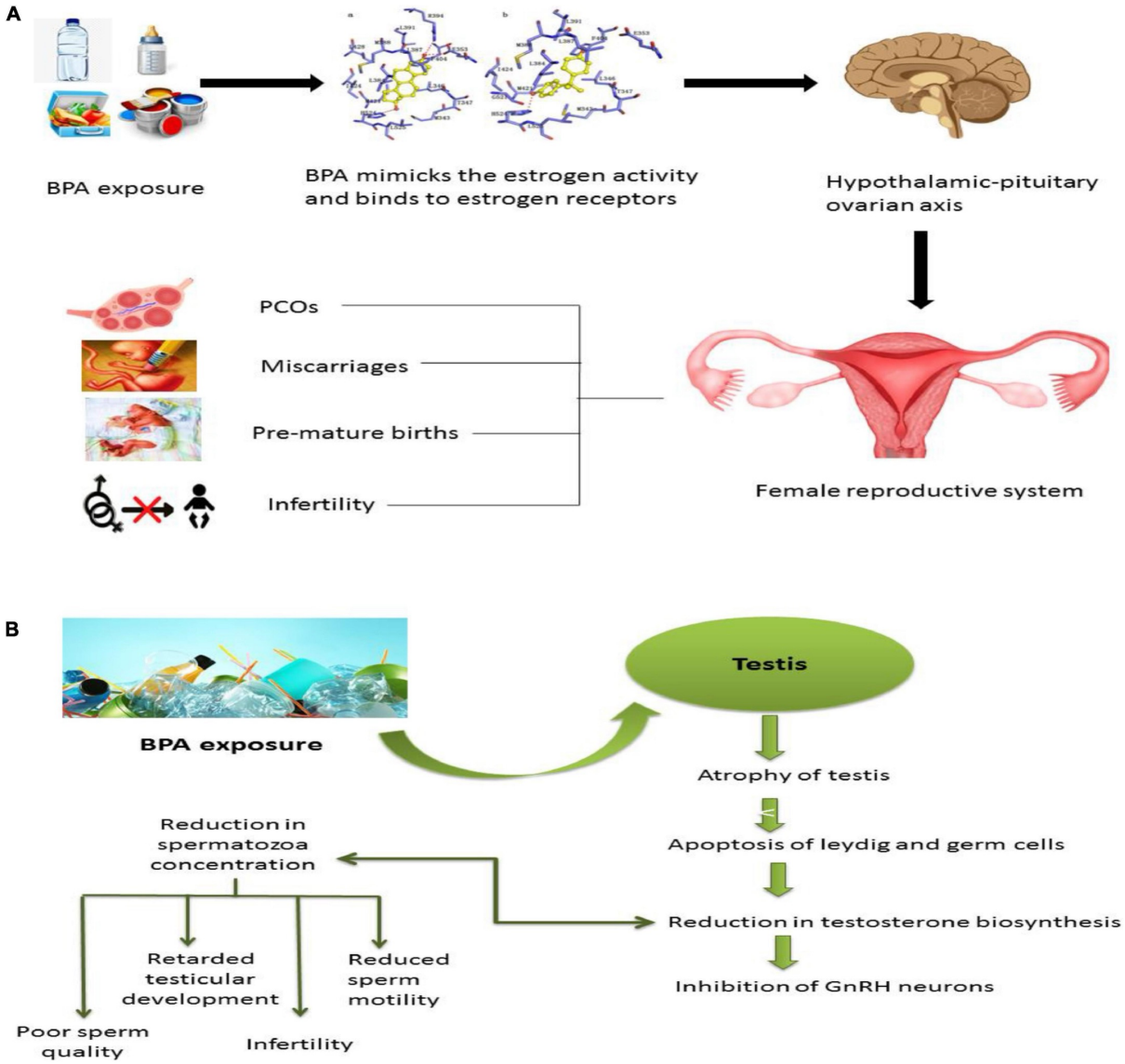

Reproductive Effects of BPA

(Manzoor et al., 2022)

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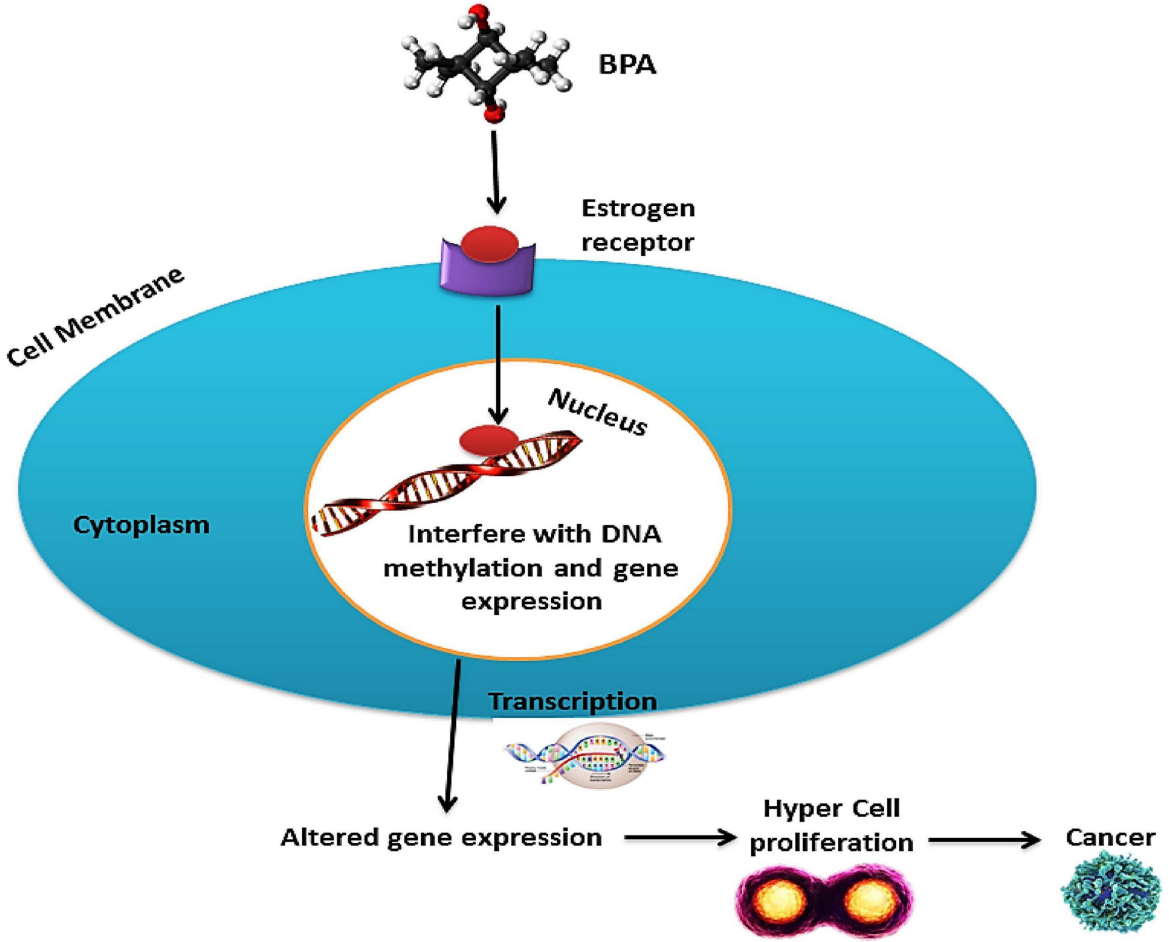
Environmental Pollution
Volume 345, 15 March 2024, 123549

Structural insight into the mechanisms and interacting features of endocrine disruptor Bisphenol A and its analogs with human estrogen-related receptor gamma ☆

Rajesh Kumar Pathak ✉, Jun-Mo Kim 👤 ✉

Carcinogenic Activity of BPA



- Linked with breast, ovarian, uterine, prostate, and testicular cancers
- Acts via oestrogen receptor–mediated signalling → promotes cell proliferation
- Alters co-regulator binding → dysregulated gene transcription
- Low-dose effects: genomic activation even at weak ER affinity

(Manzoor et al., 2022)

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Immunosuppressive Action of BPA

- Oxidative stress & mitochondrial damage → immune cell apoptosis
- Alters innate & adaptive immunity during development
- Disturbs T-cell balance:
- ↑ Th1, Th2, Th17 activity
- ↓ T regulatory (Treg) cells
- Triggers cytokine imbalance → chronic inflammation, autoimmunity
- Linked with autoimmune risk & T1 diabetes acceleration

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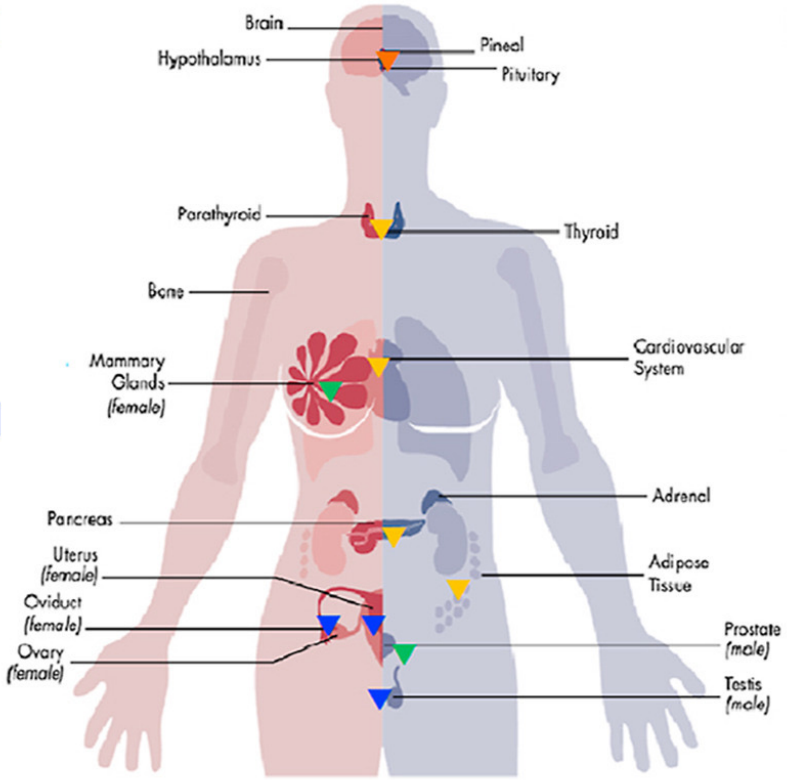
Systemic Effects of BPA

Metabolic alterations

- Overweight and obesity
- Fat tissue dysfunction
- Increase of body fat mass
- Hyperglycemia
- Insulin resistance
- Type 2 diabetes mellitus
- Thyroid dysregulation
- Hypertension
- Coronary heart disease

Reproductive disorders

- Hormonal alterations
- Precocious puberty
- Fetal growth restriction
- Preterm births and abortions
- Decreased fertility
- Ovarian and uterine hypertrophy
- Premature ovarian failure
- Reduced semen quality



Neurological disorders

- Psychomotor and mental development alterations
- Reduced cognitive ability
- Depression and anxiety
- Internalizing and externalizing behavior alterations
- Reduction of sexually dimorphic behavior

Hormone-dependent tumors

- Uterine leiomyoma
- Advanced endometriosis
- Malignant endometrial hyperplasia
- Endometrial, breast and prostate cancer

Modified from Gore et.al., 2015.

(Martínez-Ibarra et al., 2021)

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Testing BPA in the HIT

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Where BPA fits in the HIT Test?

- Included in ZRT's Advanced Urine Hormone Metabolites Test
- Dried-urine LC–MS/MS assay measuring sex & adrenal metabolites
- BPA added as environmental hormone disruptor marker
- Same collection as hormone metabolites → contextual data
- Reflects recent 24–48 h exposure

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TEST REPORT

8605 SW Creekside Place
Beaverton, OR 97008
Phone: 503-466-2445 Fax: 503-466-1636

ZRT LABORATORY

 # 2018 07 01 007 U
Ordering Provider:
Getuwell Clinic
Jim Getuwell, DO

Samples Received 07/31/2018
Report Date 08/05/2018

Samples Collected
Urine - 07/26/18 08:00
Urine - 07/26/18 10:00
Urine - 07/26/18 19:20
Urine - 07/26/18 22:30

Patient Name: Advanced Metabolites
Patient Phone Number: 555 555 5555

Gender	Last Menses	Height	Waist
Female	Unspecified	5 ft 3 in	Unspecified

DOB	Me
3/4/1960 (58 yrs)	Po

TEST NAME		
Urinary Estrogens		
Estradiol	0	
Estrone		
Estriol	0.83	0.78-1.98 µg/g Cr Premeno-luteal or ERT
E3/(E1+E2)	0.24 L	>0.3 (> median value)
2-OH Estradiol	0.21	0.17-0.70 µg/g Cr Premeno-luteal or ERT
2-OH Estrone	1.09	0.70-2.54 µg/g Cr Premeno-luteal or ERT
4-OH Estradiol	0.15	0.10-0.18 µg/g Cr Premeno-luteal or ERT
4-OH Estrone	0.47	0.17-0.47 µg/g Cr Premeno-luteal or ERT
16α-OH Estrone	0.31 L	0.35-1.07 µg/g Cr Premeno-luteal or ERT
2-OH (E1 + E2)/16-α-OH E1	4.19	1.29-5.49 Premeno-luteal or ERT
2-MeO Estradiol	0.06	0.03-0.08 µg/g Cr Premeno-luteal or ERT
2-MeO Estrone	0.51	0.26-0.68 µg/g Cr Premeno-luteal or ERT
2-MeO E1/2-OH E1	0.47 H	0.21-0.38 Premeno-luteal or ERT
4-MeO Estradiol	0.05 H	<0.04 µg/g Cr
4-MeO Estrone	0.12 H	<0.04 µg/g Cr
4-MeO E1/4-OH E1	0.26 H	0.05-0.13 Premeno-luteal or ERT
4-MeO E2/4-OH E2	0.33 H	0.10-0.29 Premeno-luteal or ERT
Bisphenol A	<dl L	1.5-4.5 µg/g Cr Postmenopausal

CLIA Lic # 38D0960850
8/10/2018 9:17:53 AM

The above results and comments are for informational purposes only and are not to be construed as medical advice. Please consult your healthcare practitioner for diagnosis and treatment.

David T. Zava, Ph.D. Laboratory Director

Alison McAllister, ND. (Ordering Provider unless otherwise specified on page 1)

TEST NAME	RESULTS | 07/26/18	RANGE
Urinary Free Diurnal Cortisol		
		.0-19.2 µg/g Cr (Evening)
		.6-8.4 µg/g Cr (Night)
		1.6-91.6 µg/g Cr (1st Morning)
		3.3-175.8 µg/g Cr (2nd Morning)
		0.6-88.5 µg/g Cr (Evening)
		5.5-44.7 µg/g Cr (Night)
		8.0 - 40.9 µg/g Cr (1st Morning)
		.3 - 31.9 µg/g Cr (2nd Morning)
		.7 - 2.2 µg/g Cr (Evening)
		.3-2.0 mg/mL (Evening)
		.3-2.0 mg/mL (Night)

ed in this calculation is less than the detectable limit. H = High. L = Low.

)125mg oral Progesterone (compounded) (1 Days Last Used)

RANGE
65-1609 µg/g Cr Premeno-luteal or PgRT
23-14.87 µg/g Cr Premeno-luteal or PgRT
4.65-76.71 µg/g Cr Premeno-luteal or PgRT
.67-2.03 µg/g Cr Premeno-luteal or PgRT
93-11.62 µg/g Cr Premeno-luteal or PgRT
52-482 µg/g Cr Postmenopausal
39-777 µg/g Cr Postmenopausal
.66-2.89 µg/g Cr Postmenopausal
.39-1.32 µg/g Cr Postmenopausal
.5-3.0
.26-0.98 µg/g Cr Postmenopausal
.32-8.17 µg/g Cr Postmenopausal
3.23-39.26 µg/g Cr Postmenopausal
3.32-59.61 µg/g Cr Postmenopausal
.5-0.7
81-711 µg/g Cr Postmenopausal
51-1474 µg/g Cr Postmenopausal
.8-29.5 µg/g Cr (1st Morning)
Free Cortisol | 15.28 L | 23.4-68.9 µg/g Cr (2nd Morning)

CLIA Lic # 38D0960850
8/10/2018 9:17:53 AM

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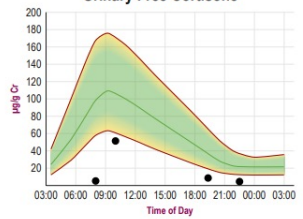
Graphs

Disclaimer: Graphs below represent averages for healthy individuals not using hormones. Supplementation ranges may be higher. Please see supplementation ranges and lab comments if results are higher or lower than expected.

Average ▼▲ Off Graph

Urinary Free Cortisone



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Bisphenol A | **<dl L** | **1.5-4.5 µg/g Cr Postmenopausal**

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Clinical Integration

- BPA acts synergistically with oestrogen metabolism patterns
- Elevated BPA + high oestrogen → added receptor activity?
- Assess phase II conjugation pathways (UGT, SULT, COMT)
- Nutrient cofactors: Mg, B-vitamins, sulphur donors
- Retest after 8–12 weeks post-intervention

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The Elephant in the Room

- BPA ≠ the only problematic plastic
- Analogues (BPS, BPF, BPAF) in “BPA-free”
- Similar or stronger ER/AR/TR binding

- BPA remains best-validated biomarker for total bisphenol exposure
- Tracks overall EDC burden and intervention success

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BPA in Practice

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Windows of Vulnerability

- Critical life stages more sensitive to endocrine disruption’
- Foetal & neonatal development, childhood & puberty, perimenopause & ageing.
- Hormonal feedback loops still forming or recalibrating.
- Low-dose exposure can imprint long-term epigenetic effects.
- Early exposure → ↑ lifetime risk of metabolic, reproductive & cognitive disorders

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BPA doesn’t just mimic oestrogen,
it disrupts the entire endocrine network

Why BPA & Hormones *Really* Matter

- Alters hormone synthesis, secretion, and transport
- Displaces hormones from carrier proteins → shifts free : bound ratios
- Disrupts pituitary feedback loops → altered LH/FSH, cortisol, thyroid output
- Anti-androgenic & thyroid-antagonistic actions
- Neuroendocrine effects: mood, cognition, stress response

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Elevated BPA?

- Context matters → review hormonal & detox status
- Check for other EDC exposures (phthalates, PFAS, microplastics)
- Exposure reduction (packaging, receipts, canned food)
- Detox support (glucuronidation, sulphation, fibre, hydration)

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Summary of FIT Tests

FIT22

22 of the most common food sensitivities including gluten, cow's milk and egg plus the Gut Barrier Panel

FIT176

176 foods including health foods such as honey, stevia and coconut oil plus the Gut Barrier Panel

FIT132

132 foods and food additives plus the Gut Barrier Panel

GBP

Assess the integrity of the gut lining by measuring Candida, Zonulin, Occludin and Lipopolysaccharides (LPS)

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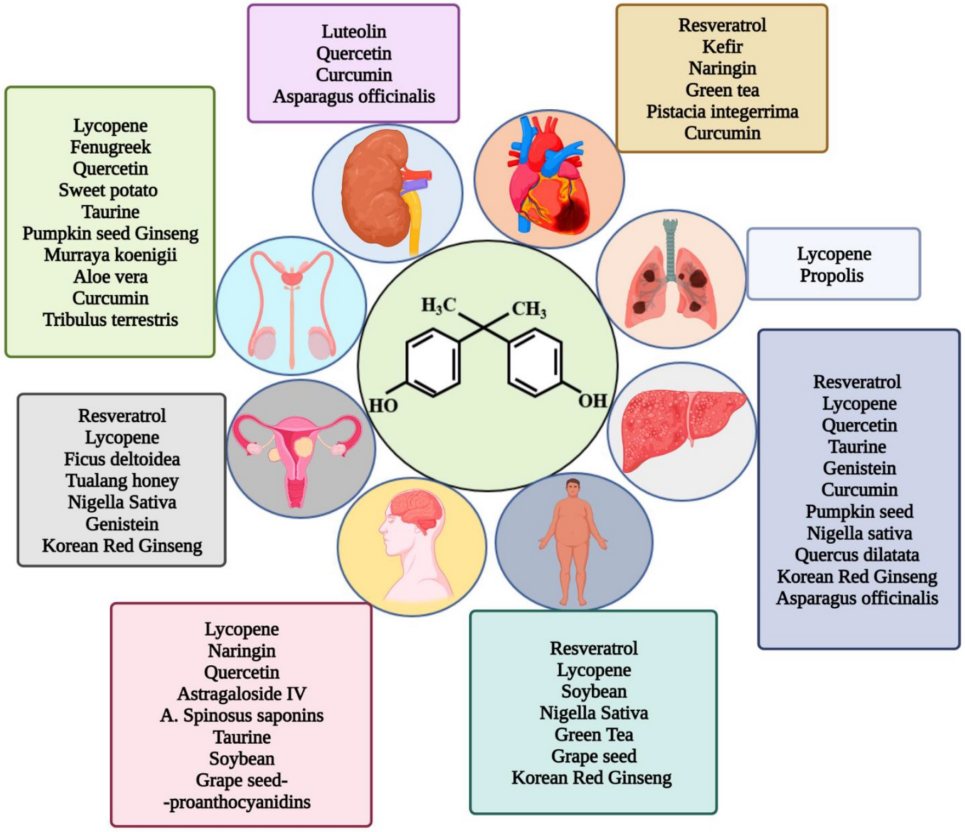
Systemic Effects of BPA



(Martínez-Ibarra et al., 2021)

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Practical Steps

- Avoid heating food in plastic → especially polycarbonate containers (look for recycle codes 3 or 7)
- Reduce canned foods → BPA often used in can linings
- Choose safer materials, e.g. glass, stainless steel, or porcelain for food & drink
- Use BPA-free baby/toddler bottles & cups
- Limit handling of thermal receipts (major BPA source)
- Store food cool & dry → heat ↑ chemical migration
- Support detox pathways → fibre, hydration, phytonutrient-rich diet

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Small daily swaps can meaningfully lower BPA burden

Summary

- BPA exposure is unavoidable in modern life, acts as an oestrogenic endocrine disruptor → multi-organ effects.
- Reducing exposure is vital, especially in windows of vulnerability
- No specific treatment for BPA toxicity in humans but natural products (NPs) show promise: antioxidant, anti-inflammatory, anti-apoptotic actions
- Botanicals & nutrients such as green tea, soy, ginseng, genistein, curcumin, lycopene, RSV may mitigate BPA effects → further mechanistic and pharmacokinetic studies are needed!

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CAN OF
WORMS

There IS Another Way!

- The Hormone Insight Test (HIT): Powered by the *Advanced Urine Hormone Metabolites Test by ZRT*
- Measures **44 hormone-related markers**
- 13 oestrogens, 8 androgens
- Diurnal cortisol & melatonin patterns
- Includes **BPA** (rarely assessed endocrine disruptor)

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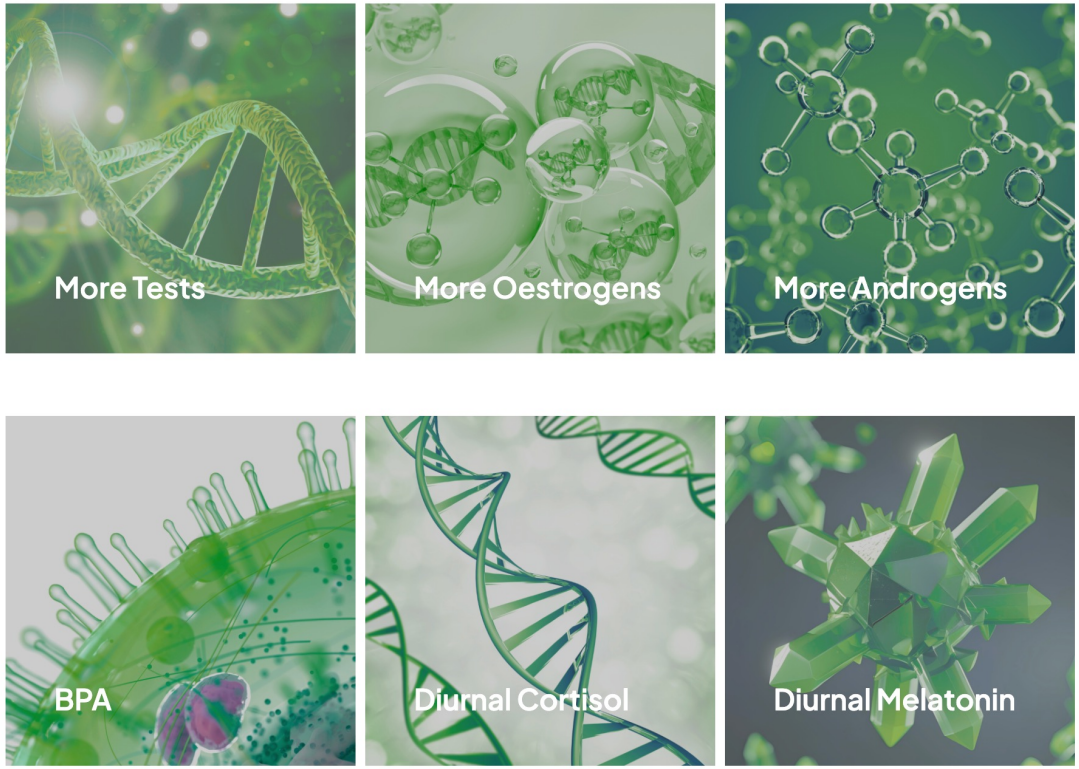
The HIT Difference



- More markers, more insight
- Comprehensive progesterone
- and androgen analysis
- No inaccurate diagrams
- More clinical value and relevance

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Stay in Touch

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Thank You

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