NUTRITIONAL TOXINS AND INFERTILITY

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INTRODUCTION

- An increasing number of researchers acknowledge the influence of environmental pollutants, such as heavy metals, organic hydrocarbons, and pesticides from various sources, on public health, particularly in reproductive disorders

- Since the early 1940s, there has been a dramatic increase in human exposure to toxic substances in air, water, soil, food, consumer products, and the workplace

lifestyle factors

- **Conclusive evidence:**
- Female age:

- Smoking: affect the follicular microenvironment and alter hormone levels in the luteal phase

- weight

- Exercise: The exercise has been shown to be associated with a reduction in risk of ovulatory infertility

- **Incconclusive evidence:**

- Caffeine: ovulation and corpus luteal function through alterations to hormone levels and has been associated with higher early follicular E2 levels in females

- Alcohol: ↑ estrogen
  ↓ FSH secretion
  direct effect on the ovum , ovulation , blastocyst development and implantation

Nutritional factors: when deficiencies of folic acid, vitamin B12 or iron have been diagnosed and treated, fertility has been restored in women who had been infertile for several years

Weight loss has been shown to increase fertility, but losing weight in this way may not be effective for increasing fertility because it deprives the body of the necessary proteins and fats necessary for hormone production

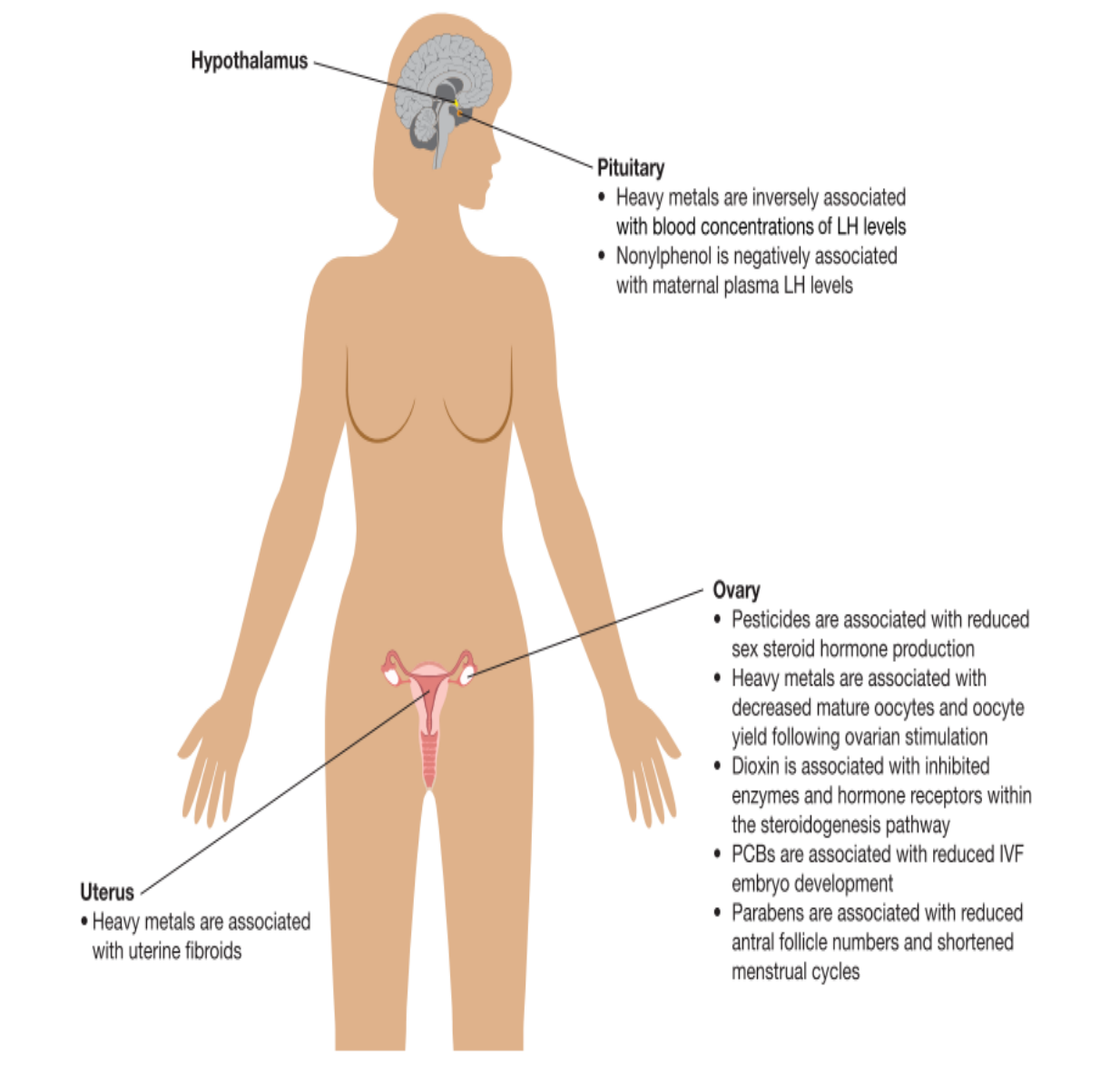
EDC

- Endocrine disrupting chemicals (EDCs) are chemicals that disrupt endocrine properties in animals by either mimicking or blocking endocrine actions.

- Specifcally, EDCs can interfere with receptor binding, steroidogenesis, and metabolism of hormones

Table 1 Overview of the chemical names and associated abbreviations discussed in the review.

Chemical name	Chemical abbreviation
Dichlorodiphenyltrichloroethane	DDT
p,p′-Dichlorodiphenyldichloroethylene	DDE
2,2′,4,4′,5,5′-Hexachlorobiphenyl	CB-153
Arsenic	As
Lead	Pb
Mercury	Hg
Diethylstilbestrol	DES
Bisphenol A	BPA
Di(2-ethylhexyl) phthalate	DEHP
Tri-2-ethylhexyl trimellitate	TETM
Di-(2-ethylhexyl) terephthalate	DEHT
Di-(isonyl) cyclohexanedicarboxylic acid	DINCH
Di-isononyl phthalate	DINP
Di-(2-ethylhexyl) adipate	DEHA
Acetyl tri-n-butyl citrate	ATBC
Bisphenol S	BPS
Bisphenol B	BPB
Bisphenol F	BPF
Bisphenol AF	BPAF
2,3,7,8-Tetrachlorodibenzo-p-dioxin	TCDD
Nonylphenols	NP
Polychlorinated biphenyls	PCB
5-Chloro-2-(2,4-dichlorophenoxy) phenol	Triclosan



Pesticide

- impaired ovarian follicular health in animal models
- decreased ovarian sex steroid hormone production in animal models
- reduced fertility in animal models
- and was associated with reduced sex steroid hormone production

Heavy metal exposure

- was negatively associated with poor ovarian follicular health
- reduced fecundity
- adverse pregnancy outcomes in women

- the perspiration caused by increased physical activity can increase heavy-metal excretion , which may reduce blood Pb, Cd, and As levels and enhance fecundity

Dioxin

- TCDD exposure during adulthood:
- impaired ovarian sex steroid hormone production,
- reduced ovarian follicular maturation,
- and disrupted uterine functions in animal models.

- Adult human exposure to TCDD was associated with
- decreased fertility,
- time to pregnancy,

  and endometriosis in women

PARABEN TRICLOSAN

- Parabens are used as antimicrobial preservatives in personal care products and different foods

Triclosan is an anti-bacterial agent . It is found in many personal care products and consumer products including antibacterial soap, mouthwash, toothpaste, surgical scrubs, and sutures

- Triclosan exposure during adulthood decreased sex steroid hormone levels and the number of live fetuses in animal models.

- Paraben exposure was associated with decreased serum sex steroid hormone levels and decreased fecundity in women.

PCB

- Polychlorinated biphenyls (PCBs) are organochlorine compounds that were once widely manufactured worldwide for industrial use

- Although their production in the United States was banned in the 1970s and their use today is highly controlled

- PCBs persist in the environment and accumulate in the food web

- Variations in menstrual and ovarian function have been observed following consumption of drinking water disinfection byproducts (DBPs) and fish contaminated with PCBs and other pollutants

- PCB exposure during adulthood altered ovarian steroidogenesis and oocyte health, increased incidence of uterine squamous cell carcinoma, and increased uterine inflammation in animal models.

- Adult exposure to PCBs was associated with subfertility,endometriosis, and uterine fbroids in women

BPA

- One of the most extensively studied endocrine disrupting chemicals is bisphenol A (BPA).

- BPA is incorporated in many daily used products as it is used by the manufacturers of polycarbonate plastics and epoxy resins.

- Despite the relatively short half-life of BPA (6–24 hours) , it was measured in various reproductive tissues , including ovarian follicular ,fluid, placenta, breast milk, and colostrum

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Evidence for bisphenol A-induced female infertility - Review (2007–2016)

Ayelet Ziv-Gal, PhD[1] and **Jodi A. Flaws, PhD**[2]

- Infertile women have higher measurable BPA levels than fertile women, and these higher BPA levels are correlated with fertility problems in women undergoing IVF treatment.

- Based on animal studies, it is likely that:

– BPA alters oviduct morphology and gene expression.

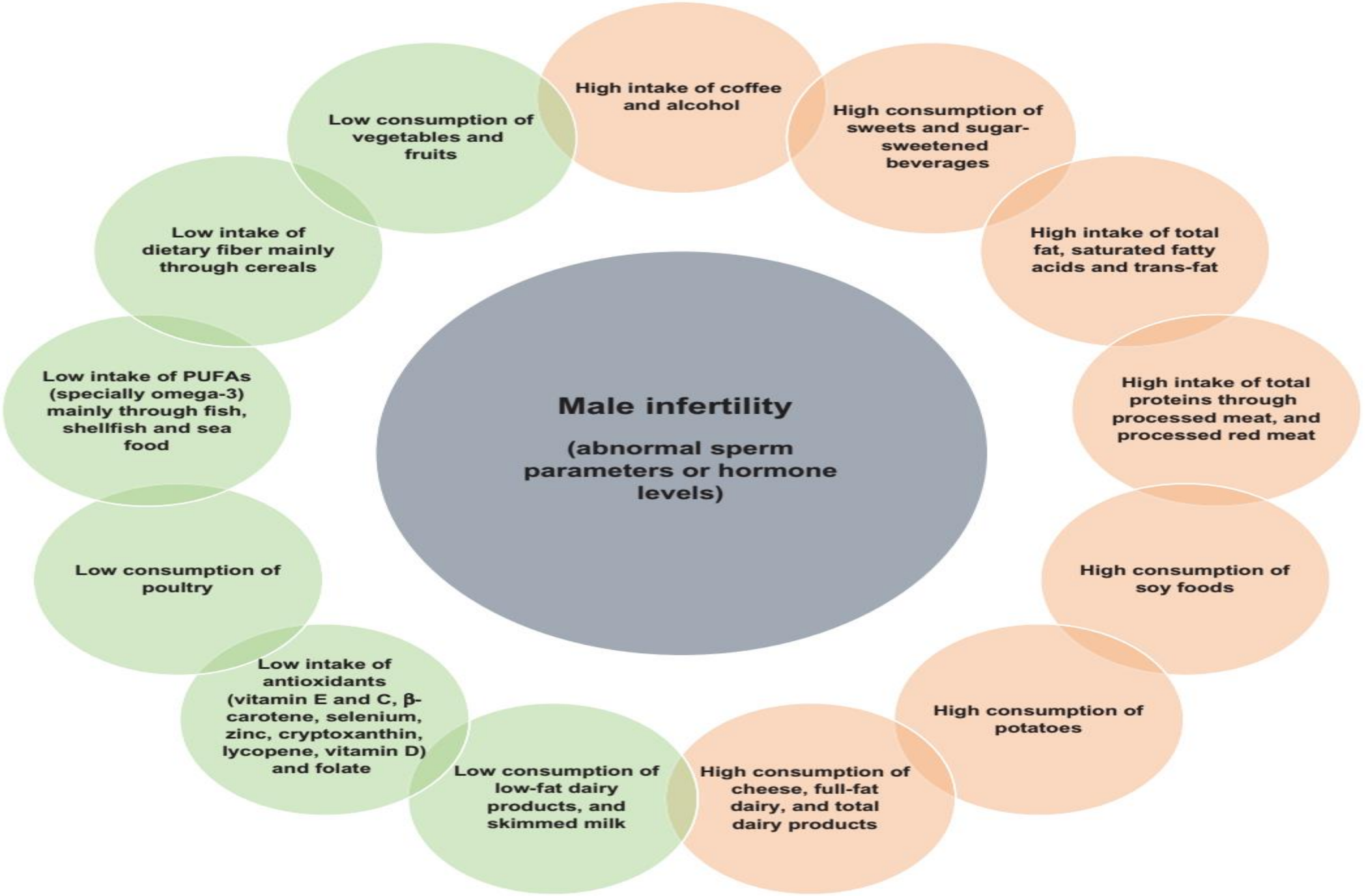
– BPA can reduce and/or impair implantation.

- BPA affects uterine morphology and function
- BPA may cause abnormal estrous cyclicity.
- BPA affects cell proliferation in the pituitary and the expression of factors related to the pituitary gonadotrophs.
- BPA affects the expression of major determinants in the hypothalamic-pituitary axis, including kisspeptin and Gnrh.
- BPA is an ovarian toxicant that is likely to act via multiple pathways including apoptosis, oxidative stress, and folliculogenesis.

Human Reproduction Update, pp. 1–19, 2017
doi:10.1093/humupd/dmx006

human reproduction update

Dietary patterns, foods and nutrients in male fertility parameters and fecundability: a systematic review of observational studies


Male infertility
(abnormal sperm parameters or hormone levels)
Low consumption of vegetables and fruits
High intake of coffee and alcohol
High consumption of sweets and sugar-sweetened beverages
Low intake of dietary fiber mainly through cereals
High intake of total fat, saturated fatty acids and trans-fat
Low intake of PUFAs (specially omega-3) mainly through fish, shellfish and sea food
High intake of total proteins through processed meat, and processed red meat
Low consumption of poultry
High consumption of soy foods
Low intake of antioxidants (vitamin E and C, β-carotene, selenium, zinc, cryptoxanthin, lycopene, vitamin D) and folate
High consumption of potatoes
Low consumption of low-fat dairy products, and skimmed milk
High consumption of cheese, full-fat dairy, and total dairy products