

Toxic chemicals and environmental contaminants in prenatal vitamins

The environmental contributors to reproductive health begin *in utero* and include the social, physical, and nutritional environment, and physical and chemical agents. Exposure to toxic environmental chemicals during pregnancy and lactation is ubiquitous and is a threat to healthy human reproduction. There are tens of thousands of chemicals in global commerce and even small exposures to toxic chemicals during pregnancy can trigger adverse health consequences. Exposure to toxic environmental chemicals and related health outcomes are inequitably distributed within and between countries; universally, the consequences of exposure are disproportionately borne by poor people.¹

Nutrition and Supplementation with Vitamins

Prenatal Vitamins are prescribed routinely for women before, during and after pregnancy to improve the nutritional status of the mother and improve the health of the fetus. Folic acid is known to decrease the risk of neural tube defects, and iron can improve neurologic outcomes in the fetus and decrease the risk of complications from postpartum haemorrhage in a mother. FIGO and other Ob/Gyn medical societies advise that during pregnancy a woman needs folic acid, iron, calcium, vitamin D, choline, omega-3 fatty acids, B vitamins, and vitamin C.^{2,3}

Although these vitamins are available from dietary sources, experience has shown that women from all countries -- high, middle and low resourced – do not obtain adequate amounts from diet alone to prevent adverse outcomes like neural tube defects, and therefore supplementation is necessary during preconception and pregnancy.

Toxic Chemicals in Prenatal Vitamins and Supplements

Physicians, health care professionals, and patients may assume that the consumption of Prenatal Vitamins and Supplements assures them of a reliable, uncontaminated source of listed nutrients. However, this is not the case. Currently, no global certification process for vitamin standards or vitamin testing exists. In other words, manufacturers may claim the content of vitamins but do not perform post-manufacturing testing to assess the validity of any content claims. In fact, studies have demonstrated Prenatal Vitamins contain significant contamination with toxic chemicals and microbials.

A recent review found that toxigenic fungi/mould/yeast were found in many of the supplements tested.⁴ This same review found that heavy metal contamination in 5% of products exceeded safety limitations, with no mechanism for removing them from market. Of even greater concern – a recent sampling of 26 commonly used prenatal vitamins, including one prescription brand, found that 40% exceeded the established level of lead toxicity, and toxic elements like aluminium, titanium, thallium, and nickel were detected in every sample.⁵

As most regulatory agencies are limited to removing products once they are proven unsafe, but not from keeping them off the market initially, the most effective approach to ensuring safety of Prenatal Vitamins is a process that tests products post-manufacturing and pre-marketing to establish that toxic chemicals and contaminants are not present.

Toxic Chemicals and Contaminants Determination

The FIGO Committee on Climate Change and Toxic Environmental Exposures brought together global scientists to review the reputable reference sources for chemicals that have the potential to impact maternal and newborn health⁶: including the USA Environmental Protection Agency, the European Union, and the California EPA.

The group of experts recommended several approaches:

1. creating a list of toxic chemicals and contaminants that should be screened for in Prenatal Vitamins and reduced to de minimis standards
2. conduct assays of existing vitamins to assess ongoing risk to maternal and newborn health; this work can extend to personal exposure risk by offering women testing for the presence of potentially toxic environmental chemicals. Mass Spectrometry currently offers the most comprehensive measurement.

This first publication of a list of toxic chemicals and contaminants represents the most comprehensive testing available at present but does not purport to identify or eliminate all potential sources of toxicity. The FIGO Committee on Climate Change and Toxic Environmental Exposures will review this list in an ongoing, iterative process and expand with an annual reassessment.

The following list of chemicals and contaminants should not be found in Prenatal Vitamins (Appendix 1).

FIGO position

Given the extensive use of vitamins and supplements, FIGO believes that a formal global regulatory environment should be put in place. A testing program that analyses vitamins before they come to market and assures consumers and clinicians regarding their safety is the standard that industry should meet and follow.

FIGO's position is that:

- Microbial and heavy metal contamination, adulteration with synthetic drugs (including drugs banned) substituting herbs, and fraudulently specifying ingredients on the label should be forbidden.
- Potentially toxic environmental chemicals should not be found in products consumed or marketed for pregnancy health.
- Clinicians should collectively advocate for regulatory changes and only recommend products tested by outside laboratories for quality and purity.
- Clinicians should educate consumers about the risks of using unverified products.

FIGO recommendations

- Patients should only consume, and Clinicians should only prescribe, vitamins and supplements that have been independently assessed to make certain they do not contain contaminants.
- Manufacturers should be held to a standard of production that assures safety and minimizes contaminants.
- Certification of all prenatal vitamins becomes the standard of care.

FIGO commitments

FIGO Committee on Climate Change and Toxic Environmental Exposures consists of global experts on toxicology, the environment, and women's health. This Committee will regularly evaluate the research and identify potentially toxic chemicals that should be avoided in Vitamins.

FIGO will do so by:

- Reviewing any needed changes to the list of chemicals that should be avoided on an annual basis by having the C2TE2 meet annually for oversight.
- Educating clinicians to the impact of toxic environmental exposures in personal care products, food, water and other means of exposure.

References

1. Di Renzo, G.C., Conry, J.A., Blake, J., DeFrancesco, M.S., DeNicola, N., Martin, J.N., Jr., McCue, K.A., Richmond, D., Shah, A., Sutton, P., Woodruff, T.J., van der Poel, S.Z. and Giudice, L.C. (2015), International Federation of Gynecology and Obstetrics opinion on reproductive health impacts of exposure to toxic environmental chemicals. *International Journal of Gynecology & Obstetrics*, 131: 219-225. <https://doi.org/10.1016/j.ijgo.2015.09.002>
2. American Congress of Obstetricians and Gynecologists: Nutrition During Pregnancy. <https://www.acog.org/womens-health/faqs/nutrition-during-pregnancy>
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4. White, CM. 2020. Dietary Supplements Pose Real Dangers to Patients. *Annals of Pharmacotherapy* 54 (8): 815-819 <https://doi.org/10.1177/1060028019900504>
5. Schwalfenberga, G., I Rodushkinb, S Genuis. 2018. Heavy metal contamination of prenatal vitamins. *Toxicology Reports* 5: 390-395.
6. Project TENDR: Targeting Environmental Neuro-Developmental Risks. The TENDR Consensus Statement. *Environ Health Perspect.* July 2016. <https://doi.org/10.1289/EHP358>

Appendix 1

Heavy Metals (name of metal and parts per billion testing)

Aluminum	(<200.0)
Antimony	(<10.0)
Arsenic	(<10.0)
Barium	(<100.0)
Beryllium	(<10.0)
Cadmium	(<5.0)
Chromium	(<20.0)
Cobalt	(<5.0)
Copper	(<50.0)
Lead	(<10.)
Manganese	(<200.0)
Mercury	(<10.0)
Molybdenum	(<400.0)
Nickel	(<10.0)
Palladium	(<10.0)
Platinum	(<5.0)
Selenium	(<50.0)
Silver	(<10.0)
Tin	(<10.0)
Thallium	(<10.0)
Tungsten	(<100.0)
Uranium	(<5.0)
Vanadium	(<50.0)
Zinc	(<400.0)

Of these 24 metals, 13 are considered dangerous to the fetus by the USA Center for Disease Control and Prevention and 7 are considered hazardous under California State Proposition 65 guidelines.

Pesticides

1. Acephate	31. Diflubenzuron	61. Kresoxim-Methyl	91. Propiconazole
2. Acetamiprid	32. Dimethoate	62. Linuron	92. Propoxur
3. Aldicarb	33. Dimethomorph	63. Lufenuron	93. Proquinazid
4. Amidosulfuron	34. Dimoxystrobin	64. Malathion	94. Pymetrozine
5. Azinphos-ethyl	35. Diniconazole	65. Mandipropamid	95. Pyraclostrobin
6. Azoxystrobin	36. Dinotefuran	66. Mepanipyrim	96. Pyridaben
7. Bifenazate	37. Ethion	67. Metaflumizone	97. Pyrimethanil
8. Bifenthrin	38. Ethirimol	68. Metalaxyl	98. Rimsulfuron
9. Bitertanol	39. Ethofumasate	69. Metamitron	99. Rotenone
10. Boscalid	40. Ethoprophos	70. Methamidophos	100. Spinosad
11. Buprofezin	41. Ethoxyquin	71. Methiocarb	101. Spirodiclofen
12. Butocarboxim	42. Etofenprox	72. Methomyl	102. Spiromesifen
13. Carbaryl	43. Fenazaquin	73. Methoxyfenozine	103. Spirotetramat
14. Carbendazim	44. Fenhexamid	74. Metrafenone	104. Spiroxamine I
15. Carbofuran	45. Fenobucarb	75. Mevinphos I	105. Spiroxamine II
16. Carbosulfan	46. Fenoxycarb	76. Monocrotophos	106. Tebufenozide
17. Chlorantraniliprole	47. Fenpyroximate	77. Myclobutanil	107. Tebufenpyrad
18. Chloridazon	48. Fipronil	78. Novaluron	108. Tebuthiuron
19. Chlorpyrifos	49. Flonicamid	79. Omethoate	109. Teflubenzuron
20. Chlorsulfuron	50. Fludioxonil	80. Oxamyl	110. Tetraconazole
21. Clofentezine	51. Fluopicolide	81. Paclobutrazol	111. Thiabendazole
22. Clomazone	52. Fluoxastrobin	82. Phenmedipham	112. Thiachloprid
23. Coumaphos	53. Flutriafol	83. Phosalone	113. Thiamethoxam
24. Cymoxanil	54. Fuberidazole	84. Phosmet	114. Thifensulfuron-methyl
25. Cyprodinil	55. Hexaconazole	85. Phosphamidon	115. Tralkoxydim
26. DEET	56. Hexythiazox	86. Pirimicarb	116. Trichlorfon
27. Desmedipham	57. Imazalil	87. Pirimiphos-methyl	117. Tricyclazole
28. Diazinon	58. Imidacloprid	88. Propamocarb	118. Trifloxystrobin
29. Dichlorvos	59. Indoxacarb	89. Propargite	119. Triticonazole
30. Difenoconazole	60. Ipconazole	90. Prophos (Ethoprophos)	120. Zoxamide

CMR Substances: Carcinogenic, Mutagenic or Toxic for Reproduction

- PBDE flame retardants
- Polyfluorinated Alkyl Substances and Perfluorooctanoic acid
- Bisphenols (A, S, ...)
- Organophosphate (OP) pesticides
- Poly Chlorinated Biphenyl's

The European Union has created a standard of 1694 chemicals that can be considered carcinogenic, mutagenic or toxic for reproduction. Use of these chemicals is prohibited. (https://single-market-economy.ec.europa.eu/sectors/cosmetics/cosmetic-products-specific-topics/cmnr-substances_en).

Annex II which lists all chemicals that are prohibited (<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009R1223-20230816#toCld71>)

Project TENDR (Targeting Environmental Neurodevelopment Risk) is an alliance of more than 50 leading scientists, health professionals, and advocates working to protect children from toxic chemicals and pollutants that harm brain development. This alliance has published a consensus statement listing chemicals that are contributing to neurodevelopmental disorders.⁶

Microbials

Extensive panel of micro testing for the following. If positive micro test would fail. The following are the tests for the final products.

Aerobic Plate Count, Yeast, Mould, TC/EC, Pseudomonas, Staphylococcus, Bile tolerant, E. Coli, Salmonella, Listeria

About FIGO

FIGO is a professional membership organisation that brings together more than 130 obstetrical and gynaecological associations from all over the world. FIGO's vision is that women of the world achieve the highest possible standards of physical, mental, reproductive and sexual health and wellbeing throughout their lives. Our work to achieve this vision is built on four pillars: education, research implementation, advocacy and capacity building.

FIGO leads on global programme activities, with a particular focus on sub-Saharan Africa and South East Asia. We advocate on a global stage, especially in relation to the Sustainable Development Goals (SDGs) pertaining to reproductive, maternal, newborn, child and adolescent health and wellbeing, and non-communicable diseases (SDG3). We also work to raise the status of women and enable their active participation in achieving their reproductive and sexual rights, including through addressing female-genital mutilation (FGM) and gender-based violence (SDG5).

We also provide education and training for our Member Societies and build capacities of those in low-resource countries through strengthening leadership, translating and disseminating good practice and promoting policy dialogues.

FIGO is in official relations with the World Health Organization and a consultative status with the United Nations.

About the language we use

Within our documents, we often use the terms 'woman', 'girl' and 'women and girls'. We recognise that not all people who require access to gynaecological and obstetric services identify as a woman or girl. All individuals, regardless of gender identity, must be provided with access to appropriate, inclusive and sensitive services and care.

We also use the term 'family'. When we do, we are referring to a recognised group (perhaps joined by blood, marriage, partnership, cohabitation or adoption) that forms an emotional connection and serves as a unit of society.

FIGO acknowledges that some of the language we use is not naturally inclusive. We are undertaking a thorough review of the words and phrases we use to describe people, health, wellbeing and rights, to demonstrate our commitment to developing and delivering inclusive policies, programmes and services.

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