



Commentary

Nowhere to hide: Chemical toxicants and the unborn child

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ABSTRACT

Contemporary reproductive aged women and their offspring are facing an unprecedented onslaught of toxicant exposures from myriad sources in their day-to-day life. Public health recommendations regarding optimal diet and nutrition in pregnancy must incorporate several considerations including safety of available foodstuffs, cultural practices and lifestyle issues. Gestational consumption of contaminated seafood remains a potential source of toxicant exposure, including mercury, for the developing child. Health care professionals responsible for the care of women and their developing children need to become apprised of: a) risks associated with toxicant bioaccumulation in pregnancy; b) ongoing information emerging in the important field of reproductive toxicology; and c) strategies within the clinical setting to facilitate nutritional sufficiency and precautionary avoidance of adverse exposure among young women.

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Many thanks to Dr. Dorea for the kind words about my article "To sea or not to sea: benefits and risks of gestational fish consumption" [1] and for elucidating potential sequelae of dietary transition from seafood to contaminated terrestrial foodstuffs in selected cultures. He also cautions that fetal mercury exposure may originate from multiple sources including administration of thimerosal-containing vaccinations during gestation. By stepping back and extending the scope of vision, Dr. Dorea raises concerns about non-seafood sources of fetal toxicant exposure as well as highlighting the need to incorporate cultural, lifestyle and environmental differences when making public health recommendations in specific regions. His comments underscore the reality that even within the confines of the womb, the developing child is at serious risk of low-level poisoning from various sources and that assessment of seafood toxicants provides only a limited glimpse into the increasing expanse of fetal exposures. If we follow Dr. Dorea's track, however, we can take another step back and further broaden the view of gestational toxicant exposure.

Innumerable contaminants originating from myriad sources are being shunted to unborn children through vertical transmission from unsuspecting mothers—exposures that may have accrued prior to, or during the gestational period. On a daily basis, toxicants are being delivered into maternal lungs through inhalation, transported to the cribriform plate via the olfactory conduit, absorbed into the bloodstream by dermal exposure, deposited into the gut through ingestion, and delivered directly into tissues by dental

work, surgical implantation, injections, and body art such as tattoos. As a result, the largest study ever performed on toxicant bioaccumulation in humans which was carried out by the Centers for Disease Control revealed that most contemporary American women carry numerous and assorted toxic chemicals [2]. Consequently, the American Red Cross recently found alarming numbers of synthetic pollutants including mercury in a study of umbilical cord-blood samples [3]. Where are reproductive aged women and their offspring in Western cultures, for example, acquiring such contaminants?

After a night's rest on bedding treated with brominated flame retardants, many pregnant women rise and shower—inhalating vaporized trihalomethanes from chlorinated water and often washing with antibacterial soaps containing triclosans. After applying various cosmetics, creams and deodorants containing hormonally active parabens and metalloestrogenic aluminum, women commonly brush their teeth including their dental amalgams—the main source of mercury exposure in non-occupationally exposed populations [4]. Personal care products such as perfume, nail polish, and hairspray – all potentially containing assorted toxicants and endocrine disrupting compounds – are often utilized as mothers-to-be prepare for their day.

Traveling by car to and fro, drivers and passengers inhale carbon monoxide, cadmium and assorted diesel compounds from vehicle exhaust as well as solvent emissions in new cars and benzene fumes when gassing up. In the workplace, many expectant mothers smell chemical air-fresheners and inhale volatile organic compounds off-gassing from some upholstery, construction materials, floor coverings and paint. Some workers in factories, laboratories and manufacturing plants are occupationally exposed

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on a daily basis to toxic solvents and assorted industrial compounds.

Within their homes, women commonly prepare food from cans releasing bisphenol-A (BPA) from liners, cook with pots discharging aluminum or non-stick pans releasing perfluorinated compounds, and ingest foodstuffs doused with varied chemical preservatives, pesticides, coloring agents and flavoring substances. To satisfy thirst, chlorinated and fluorinated water inadvertently contaminated with assorted waste products including some excreted pharmaceuticals are often imbibed from plastic beverage containers leeching out estrogenic phthalates or BPA. When cleaning up the house, the brain and lungs of unsuspecting women are regularly barraged by toxic compounds emanating from assorted cleaning and disinfectant products.

The troubling truism is that insufficient space exists in a brief paper to adequately list the multitude of common maternal chemical exposures and to review all the emerging literature linking gestational toxicant status with potential adverse sequelae for the developing child in the short- and long-term. Essentially, however, increasing evidence suggests that maternal exposure to toxic chemical compounds may be associated with various congenital defects [5,6], pediatric problems [6], skewed gender ratios [7], lethal cancers in children and teens [8], psychosexual challenges [9], as well as reproductive and endocrine dysfunction in later life [10,11]. Just as endogenous hormones such as insulin, testosterone or estrogen have physiological or developmental effects at parts per billion, toxicants can also exert bioactive influence at exceedingly low levels.

Dr. Dorea's desire to expand the reproductive toxicology discussion is welcome and I exhort the medical community responsible for the clinical care of pregnant women to become cognizant of the contemporary pandemic of maternal and fetal chemical exposures. It is particularly noteworthy that emerging research suggests that although gestational toxicant bioaccumulation and nutritional deficiency account for many maternal and pediatric health problems, credible preconception care which addresses these risk factors has enormous potential to obviate many adverse health outcomes in both mothers and children [12]. Much to the dismay of some scientists, however, contemporary clinical fetal assessment in the early stages primarily focuses on after-the-fact prenatal screening through biochemical investigation, genetic testing and prenatal ultrasound—rather than exploring and precluding the source causes of fetal pathology, etiology is often ignored and a meticulous 'search and destroy' mission is routinely undertaken on the lookout for developing children deemed to be imperfect.

In the last 50 years, we have learned how to create and unleash thousands of new synthetic chemicals into our homes, workplaces, schools and playgrounds; in the next 50 years we will learn the gravity of what we have done. In response to our unprecedented age of ubiquitous toxic exposure, I anticipate that future genera-

tions of scientists will look back with disbelief at a medical culture that permitted poisoning of reproductive aged women and ignored ramifications to unborn children. The irreparable disruption of normal intra-uterine human development may turn out to be one of the greatest unintended outcomes of the chemical revolution of the 20th century. Although discussion of gestational toxicant exposure via fish consumption, vaccination, and terrestrial food is important, it is only representative of a much broader clinical and environmental problem. The study of reproductive toxicology merits urgent and systematic attention in obstetrical and midwifery training programs as this discipline will become increasingly important when the escalating prevalence of toxicant affected children manifest the health and social sequelae of their adverse prenatal exposures—a problem that has already begun [13].

Conflict of interest

There is no conflict of interest.

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