Review

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Understanding PFAS Exposure, Health Effects, and Risk Mitigation in Neonates, Infants, and Pediatric Population

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Understanding PFAS Exposure, Health Effects, and Risk Mitigation in Neonates, Infants, and Pediatric Population

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Abstract

Per- and polyfluoroalkyl substances (PFAS) are a diverse category of persistent organic pollutants used in many consumer and commercial items due to their beneficial physical properties such as repelling water, grease, stains, and heat resistance. However, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) are associated with significant health risks arising from their endocrine-disruption effects. Endocrine disrupting chemicals (ED) interfere with normal hormonal functions in humans, including growth and development, reproduction, metabolism and energy balance, and control of cell proliferation. While these risks affect humans of all ages, neonates, infants, and pediatric populations are particularly vulnerable. This review examines the various pathways by which PFAS can enter the human body, including transplacental transfer, breast milk, contaminated water, food sources, dust, and direct exposure to consumer products and their impact on development, reproduction, and the neurological system, implicated in issues with cognition, behavior, and hormonal regulation. Despite progress in eliminating legacy PFAS, challenges persist in understanding the health impacts of short-chain and novel PFAS exposures. This report proposes methods to reduce PFAS exposure through legislation and policy measures, such as restricting the hazardous chemicals and establishing exposure thresholds for children, in conjunction with consumer-level initiatives, including public education to minimize exposure. Given the limited safety data available for pediatric populations, it is crucial to develop and utilize modern analytical techniques and conduct evaluations to understand the risks associated with PFAS.

Keywords: per- and polyfluoroalkyl substances (PFAS); endocrine disruptors (ED); pediatrics

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1. Introduction

1.1. PFAS and Endocrine Disruptors (EDs)

Per- and polyfluoroalkyl substances (PFAS) are a category of persistent organic pollutants associated with significant risks to human health and the environment. Official estimates by the Environmetal Protection Agency suggest there are more than 15,000 PFAS compounds ever synthesized (Chang et al., 2025). Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) are the most prevalent and extensively researched PFAS, mainly due to their reported endocrine disruption effects. PFAS are used in various consumer products and industrial applications due to their beneficial chemical and physical characteristics (Glüge et al., 2020). These include their ability to repel oil and water, resist temperature and chemical exposure, and surfactant effects.. The componds are also used in the manufacture of firefighting foams, non-stick coatings for metals, food packaging materials, cosmetics, textiles, photography products, chrome plating processes, pesticides, and pharmaceuticals (Cordner et al., 2024). PFAS are known to accumulate in humans, animals, and the surrounding environment. Among the limited number of PFAS that have been thoroughly researched, the majority are regarded as possessing moderate to high levels of toxicity, especially in children's health and development (Fenton et al., 2021).

Telomerization and electrochemical fluorination (ECF) are the main synthetic pathways for the manufacture of PFAS (Ames et al., 2025). The latter production process, ECF, presents additional risks by generating fluorinated side and byproducts that contaminate and increase the risk of environmental pollution. Human exposure to PFAS is widespread but variable by occupation and geography. Workers in aerospace, automotive, electronic, and construction industries face a higher risk of exposure due to the wide use of the chemicals in semiconductors, fuels lines, seals, batterises, and surface coatings used in the industries (Solan and Park, 2024). Environmental exposure to PFAS arises from consuming contaminated food and water, breathing contaminated air, direct skin contact with products containing PFAS (Solan and Park, 2024). Estimating the risk of exposure to these products is difficult due to the high number of compounds, geographical differences in exposure, and incomplete disclosure of constituents in industrial products (Alazaiza et al., 2025). Reported evaluations have found PFAS in various products, including hydraulic fluids, food contact materials, building materials, and aqueous film-forming foam used in firefighting (Hoadley et al., 2023).

Per- and polyfluoroalkyl substances (PFAS), also known as *forever chemicals* due to their persistence in the environment and biological systems, present real dangers to human health, such as increased risk of cancers (thyroid, kidney, prostate, testicular), reproductive toxicity (low birth weight, preeclampsia), endocrine disruption (thyroid function, cholesterol regulation), neurotoxicty, and impacts on the immune system (Mišľanová and Valachovičová, 2025). These hazards are exacerbated by the slow degradation of the products in nature and human bodies due to the strong carbon-fluorine bonds, making them a long-term public health problem (Evich et al., 2022). Some PFAS, such as fluoropolymers are ubiquitous components of essential medical devices, including implants and stents due to their unique properties, such as lubrication, insulation, and biostability. However, regulators such as the European Medicine Agency (EMA) require manufacturers to justify their use of PFAS if they are classified as carcinogenic, mutagenic, or nephrotoxic compouds (CMR) or endocrine disruptors (ED), especially if their concentration in polymers exceeds 0.1% w/w (De Jong et al., 2020). The FDA monitors the safety of fluoropolymers in medical devices by analysing current scientific evidence and post-marketing safety reports.

1.2. PFAS Exposure Impact on Neonatal, Infant, and Pediatric Populations

According to several studies, PFAS may impair language, motor, and cognitive development in infancy and early childhood, and increase behavioral changes, such as hyperactivity and inattentiveness in middle childhood and adolescence. Evidence linking to autism and mid-childhood cognitive deficits remains inconclusive (Ames et al., 2025; Bedford et al., 2017; Brian et al., 2016). Studies show distinct sex variations in these correlations, such as a higher risk of attention-deficit hyperactivity disorder (ADHD) in girls and cognitive declines in males due to PFAS exposure (Liew et al., 2015).

The majority of research has focused on legacy, long-chain PFAS, such as PFOA and PFOS, due to their persistence in the environment, established detection methods, and consensus on their health and environmental impact (Cheng et al., 2022). Short-chain PFAS have received less attention due to their novelty and existence in lower concentrations in consumer and industrial products, constraining the ability of public health authorities to detect them during routine monitoring and evaluation programs. However, according to several recent studies, short-chain PFOA and PFOS may also be associated with neurodevelopmental issues and may be more effective than traditional PFAS at crossing biological barriers such as the blood-brain barrier and the placenta (Currie et al., 2024).

A few studies have examined post-natal exposures, detecting PFAS in breast milk and infant blood; however, the majority have concentrated on prenatal exposures. Evidence indicates blood PFAS concentrations fluctuate during the course of a pregnancy despite the long half-life, likely due to variations in placenta permeability and plasma volume (Ames et al., 2025). Post-natal exposures to PFAS are important to consider because the brain continues to develop throughout life, with infancy and puberty potentially being times of increased susceptibility. Depending on the particular

PFAS and the regional history of PFAS production and use, children are typically exposed to higher levels of PFAS compared to adults due to their higher surface area to body weight ratio and more hand-to-mouth actions (Zhou et al., 2023).

Understanding the factors that put children at risk for neurodevelopmental problems is crucial for eliminating and preventing harm. Children are particularly susceptible to injury from PFAS for two main reasons: their ongoing growth and increased likelihood of exposure. Children undergo growth and transformation, particularly in relation to their organs, immune systems, and hormones. PFAS disrupts biological processes, making exposure during critical developmental periods, such as infancy and adolescence, more detrimental than in adults. Minor developmental issues can lead to enduring health complications such as low birth weight, compromised immune systems, hormonal abnormalities, or diseases that manifest later in life. Secondly, children consume a greater quantity of PFAS per the body weight compared to adults (Panieri et al., 2022). They consume higher quantities of water, food, and air per kilogram of body weight. They are also inclined to place their hands in their mouths more frequently, increasing the likelihood of contact with dust or contaminated surfaces. Additionally, evaluation and monitoring of PFAS-associated harms in children is influenced by the timing and choice of neurological assessment (Ames et al., 2025). Li et al. (2024), found no discernible correlation between PFAS exposure and the language and behavioral development of children in a meta-analysis of 271 studies. These inconsistencies arise in part due to the absence of standard outcome classification using tools for evaluating language development or diagnosing language disorders, as most investigations concentrate on general developmental assessments (Dehghani et al., 2025). Moreover, toddlers often exhibit lower behavioral diversity than adults and older children, complicating the measurement of phenotypic traits attributable to PFAS accumulation. For example, executive deficits may not be evident in children younger than five years and changes may not be consistent to support a diagnosis (Lee et al., 2025). Other characteristics such as internalising behaviours and ADHD are hardly noticeable before children attain school age.

1.3. Objectives of the Review

- Identify and characterize the primary pathways through which neonates, infants, and pediatric populations are exposed to PFAS.
- Investigate the present scientific understanding of PFAS impacts on developmental, reproductive, and neurological health, with a focus on at-risk populations.
- Highlight the inadequacies of current research and provide risk mitigations.

2. Exposure Routes for PFAS in Neonates, Infants, and Pediatrics

Children are exposed to PFAS in utero through placental transfer, post-partum through breast milk, contaminated formula prepared with PFAS-contaminated water, contaminated food and surfaces, and inhalation of contaminated air. Direct contact with PFAS-containing objects or tainted environmental media can result in exposure (Ragnarsdóttir et al., 2022).

2.1. Consumer and Household Products

PFAS may be present in various consumer products used by or around infants, which could result in direct exposure. These products include textiles and personal care products.

Textiles: PFAS are added to natural and synthetic fabrics to make them resistant to water, stains, and oil. Legacy PFAS, such as PFOA, have been detected in children's textiles, even those sold with "green" or "non-toxic" labels (Newland et al., 2023). Examples of items that usually come into contact with children's skin include play mats, blankets, toys and clothes. Carpets and upholstery containing PFAS increase exposure through direct skin contact and particle release into the air. Additionally, textiles release PFAS into waste water systems during washing that may find its way to potable water sources (Cantoni et al., 2024).

Diapers and Wipes: Significant quantities of PFAS (up to 23% in one study) have been found in disposable and reusable diapers and associated accessories (Zhou et al., 2023). Diapers pose a higher risk for dermal PFOA exposure to direct infant skin contact for a longer duration, often in moist conditions when caregivers delay to change them after short calls (Zhou et al., 2023).

P**ersonal Care products:** PFAS are ingredients in various personal care products, such as lotions, shampoos, sunscreens, diaper creams, and cosmetics (including foundation, eye makeup, and nail polish) as texture enhancers and to improve water and oil resistance (Habib et al., 2024). The PFAS in creams, lotions, and other personal care products used by the mothers penetrate the skin to access the systemic circulation and onwards into breast milk, adding to the amounts absorbed through the baby's thinner skin from cosmetics and fabrics containing the compounds (Khan, 2022).

2.2. Ingestion

Recent research has demonstrated that the primary route of exposure to perfluoroalkyl substances in the general population is through dietary ingestion from contaminated water and the use of non-stick cookware (Domingo and Nadal, 2019). Additionally, transplacental passage and breastfeeding are the primary routes of exposure to PFAS for newborns (Currie et al., 2024). Furthermore, the consumption of seafood was found to have a positive correlation with PFAS levels in human blood (Wei et al., 2024; Yamaguchi et al., 2013). A case series found that ingestion of PFOA and PFOS through food accounted for approximately 20% of the serum concentration in 307 men and 301 women (Ding et al., 2020). A Danish study concluded that elevated serum PFOS levels were connected with the consumption of red meat, animal fat, and snacks, but not with the consumption of fish (Halldorsson et al., 2008).

Other household products contributing to PFAS exposure include grease resistant packaging, cleaning products, and plastics. Detergents may leave residues containing PFAS which may contact children's skin or be released into the environment; strollers, toys, car seats, and furniture may contain PFAS and release them into the home environment (Salakka, 2023).

2.3. Sources in the Environment

Environmental sources of PFAS include indoor dust, contaminated water and soils.

Indoor dust: Dust serves as an accumulator and a secondary source of exposure to PFAS shed from carpets, upholstery, clothing, and other materials. Children come into close contact with dust because they spend a lot of time on or near the floor and frequently engage in hand-to-mouth activity after touching surfaces. In addition to providing a source of PFAS through contact, ingestion, and inhalation, PFAS held in dust contaminate soils and water sources (Ismail et al., 2023).

Contaminated water: Water soluble PFAS readily access groundwater sources, allowing them to spread and persist in the environment. PFOAs with hydrophobic carbon chains and hydrophilic carbonyls groups may form micelles in water, enabling them to form dynamic solutions and suspensions to facilitate their transport in groundwater and absorption following ingestion (Guelfo et al., 2021; Panieri et al., 2022).

Contaminated Soil: PFAS contamination of outdoor soil can occur near airports, industrial facilities, or locations where biosolids containing PFAS have been applied. Contaminated soil particles collect in dust that settles on indoor and outdoor surfaces, from which infants and toddlers ingest them. Rather than direct skin absorption, PFAS exposure from contaminated soil is mostly through inadvertent intake through hand-to-mouth activity (Wang et al., 2023).

3. Health Impacts of PFAS Exposure

3.1. Developmental and Reproductive Effects

Studies on both people and animals have linked per- and polyfluoroalkyl substances (PFAS) to several adverse effects on development and reproduction. Several studies have shown that mothers who were exposed to PFOA and PFOS have a higher incidence of giving birth to babies with lower birth weight (Apelberg et al., 2007, Negri et al., 2017, Nolan et al., 2009, Whitworth et al., 2012). Similar reductions in fetus weight have been reported in animal reproductive toxicity studies for PFOA, PFNA, PFHxS, and PFDA (Lau et al., 2006). The U.S. Environmental Protection Agency (EPA) suggests that restricting PFOA and PFOS in drinking water might save more than 1,200 lives each year that are associated with low birth weight (Garnick et al., 2021).

In males, exposure to PFOA and other PFAS has been linked to male infertility (Hærvig et al., 2022). Boys born to mothers exposed to PFAS, notably PFOA and PFHpA, have lower sperm concentration, total sperm count, and semen quality (Hærvig et al., 2022). Adult men exposed to high levels of these chemicals in the environment also exhibit poor semen quality (Hallberg, 2021). Human and animal studies demonstrate that exposure to PFOA lowers testosterone levels and sperm counts, explained by the anti-androgenic and hormone-disrupting actions of the compounds that interfere with normal reproductive hormone signaling and sperm production (Dickman and Aga, 2022; Lin et al., 2024; Tarapore and Ouyang 2021). In females, PFAS exposure has been associated with lower fertility and a longer time to conceive. Studies have identified links between PFOA, PFOS, PFDA and PFHpA, and delayed conception or lower chances of getting pregnant (Haimbaugh et al., 2024, Kirk et al., 2018). Qu et al. (2024) found higher concentrations of PFOS, PFOA, PFHxS, and PFNA in nulliparous women than in parous women in a study that assessed PFAS exposure during the early stages of pregnancy in women from the Boston-area Project Viva cohort.

Exposure to PFAS has also been associated with reduced durations of breastfeeding (Hoadley et al., 2023, Nielsen et al., 2022). Animal exposure studies demonstrated that PFOA negatively impacts the development of mammary glands (White et al., 2007, White et al., 2011). Since research has indicated that women who have never nursed had greater levels of PFAS, particularly PFOS and PFOA, breastfeeding may also be a significant pathway for PFAS excretion in postpartum women. Timmermann et al. (2023) concluded that breastfeeding lowers mothers' serum concentrations of PFAS due to secretion of the compounds in milk; thus, women who have breastfed for prolonged durations tend to have lower plasma concentrations of certain PFAS than controls.

PFAS exposure interferes with expected antibody responses to immunizations, resulting in lower antibody titers following administration of tetanus, diphtheria, and other pediatric vaccines (Zhang et al., 2022). Pregnant women who were exposed to PFAS, especially PFOS and PFHxS, had changes in their thyroid-stimulating hormone (TSH) levels (Aimuzi et al., 2020, Jensen et al., 2022). Animal studies have shown that exposure to more than one form of PFAS can disrupt thyroid hormone function (Coperchini et al., 2021).

3.2. Endocrine Disruption

Endocrine disrupting chemicals are endogenous or exogenous chemicals that mimic, block, or alter the actions of endocrine hormones. Endocrine hormones are produced by various endocrine glands to control essential biological processes such as fertility, reproduction and growth. They include estrogen and testosterone hormones, female cycle and ovulation regulators (follicle stimulating hormone, luteinizing hormone, and progesterone), and thyroid hormones. PFAS and other EDs affect endocrine hormone activity by interacting with or activating hormone receptors, antagonizing hormone receptors, altering hormone receptor expression, altering signal transduction by changing protein expression, synthesis, and post-translational modifications, inducing epigenetic changes, and altering hormone kinetics, including synthesis, transport, distribution, metabolism, clearance and receptor sensitivity (La Merrill et al., 2020). PFAS has been shown to alter prolactin and human chorionic gonadotropin (hCG) levels, impacting the development and functioning of placental and breast tissue, including premature breast development in girls and abnormal breast development in boys (Zhang et al., 2018). Studies on the breast and mammary glands have revealed that PFAS directly influence tissue by affecting breast cells in culture and accumulating in the mammary gland tissue of exposed mice, increasing proliferation and migration of breast cells and interfering with mammary gland development and function that predisposes the affected breast to cancer (Rickard, Rizvi and Fenton, 2022). This is also evident in the placenta, as research has shown that exposure to PFAS alters the function of placental cells in mice and culture (Rickard, Rizvi and Fenton, 2022).

3.3. Neurological Effects

Various neurological conditions have been linked to the buildup of PFAS in the central nervous system (CNS), including cognitive impairments, neurodevelopmental abnormalities, and neurodegenerative diseases (Bharal et al., 2024). Due to their lipophilic nature, PFAS tend to accumulate in tissues rich in lipids, including the brain, where they can cross biological barriers such as the blood-brain barrier (BBB). PFAS induced neurotoxicity can occur through various direct and indirect pathways (Bharal et al., 2024). Exposure to PFAS has been linked to neuronal impairment through BBB disruption, calcium dysregulation, neurotransmitter changes, neuroinflammation, oxidative stress, and mitochondrial dysfunction (Starnes et al., 2022). Although research has made tremendous progress, significant gaps remain that need to be addressed to fully understand the range of PFAS-mediated neurotoxicity (Li et al., 2024).

3.4. Long-Term Risks

Long-term exposure to PFAS is increasingly linked to substantial long-term health hazards, as they persist in the environment, accumulate in living organisms, and remain biologically active (Fenton et al., 2021). Epidemiological and toxicological research has shown that PFAS, especially PFOA and PFOS, raise the risk of getting certain types of cancer, such as kidney and testicular cancer (Ragnarsdóttir et al., 2022). Also, endocrine disruption effects of PFAS include changes in metabolism and energy balance that can lead to obesity, high cholesterol, and insulin resistance, all of which are linked to heart disease and type 2 diabetes (Cordner et al., 2024). Their effects on hormone regulation and immunological function significantly increase the risk of chronic disease throughout a person's life (Gao et al., 2023). Due to this, they pose a long-term health risk and a significant public health and environmental concern (Hoadley et al., 2023).

4. Current Knowledge and Data Gaps

With the help of samples such as dried blood spots, cord blood, and breast milk, biomonitoring activities are increasingly focusing on PFAS (per- and polyfluoroalkyl compounds) in sensitive groups. Even though difficulties persist in reliably detecting short-chain PFAS and new PFAS compounds, there are also challenges in understanding the potential health implications of these substances, particularly during the early stages of development. PFAS with shorter chains and developing PFAS might be more challenging to measure than other PFAS due to their lower concentrations and occasionally differing physicochemical properties. This necessitates the use of more complex analytical techniques (Panieri et al., 2022).

Limited Data: There is inadequate comprehensive data on the incidence and health impacts of short-chain and emerging PFAS, particularly in vulnerable populations.

Cumulative Effects: It is possible that cumulative exposure to many PFAS, which may include both legacy and developing compounds, may result in larger health concerns than exposure to individual compounds.

Standardization: There is a need for standardized procedures for measuring PFAS in diverse biological matrices and for creating reference values for various PFAS in different age groups. Standardization is also necessary for establishing reference values.

Health impacts: The health impacts of short-chain and developing PFAS are still being explored, particularly at low levels of exposure during early development. This is especially true for exposed individuals.

Endocrine disruptors (EDs):Polyfluoroalkyl substances (PFAS), particularly those with longer carbon chains, have been identified as having the potential to disrupt the endocrine system, which

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can have an effect on hormone levels and may subsequently cause developmental and reproductive problems.

Need for a full Assessment: In order to conduct a full evaluation of PFAS as EDs, it is necessary to take into account their effects on a variety of endocrine pathways, as well as their potential for either synergistic or antagonistic interactions with other EDs.

Regulatory Deficits: There is a requirement for more stringent regulations and guiding values for PFAS and occupational hazards.

5. Strategies for Reducing PFAS Exposure

5.1. Regulatory and Policy Interventions

The elimination of legacy PFAS chemicals such as PFOA and PFOS, the regulation of the use of PFAS replacements, and the establishment of specific exposure limits for vulnerable populations, notably neonates, infants and pediatric, are some of the critical initiatives that can be implemented in order to reduce exposure to PFAS through regulatory and legislative interventions (Wei et al., 2024)

In order to phase out legacy PFAS, it is necessary to restrict the manufacturing and use of hazardous PFAS such as PFOA (perfluorooctanoic acid) and PFOS (perfluorooctanesulfonic acid).

Determining exposure limits tailored to children:

Children are more vulnerable to the harmful effects of PFAS due to their continuous physical growth and increased exposure pathways relative to their body weight. Therefore, necessitates the establishment of explicit and stringent exposure limits for this population. Exposure to PFAS at levels below two nanograms per millilitre (ng/mL) is not anticipated to have adverse health effects. Between 2 and 20 ng/mL, negative consequences are possible, particularly in vulnerable populations. Whereas, over 20 ng/mL, there is a higher chance of negative health effects (National Academies of Sciences and Medicine, 2022).

5.2. Consumer-Level Actions and Public Health Education Initiatives

The establishment of maximum contamination levels (MCLs) for perfluoroalkyl substances (PFAS) in drinking water, the regulation of PFAS in food packaging, and the implementation of tougher industrial discharge limits are all examples of this.

Remediation of polluted sites: It is also extremely important to address the PFAS contamination that is already present in the soil and water through remediation operations. It is possible that this may involve the use of technologies such as reverse osmosis or activated carbon adsorption to eliminate PFAS from water sources. The identification and reduction of PFAS releases from industrial sources, firefighting foams, and other pathways can significantly reduce overall exposure. Source reduction is a term that refers to the process of reducing exposure.

Observation and test procedures: Monitoring the levels of perfluoroalkyl substances (PFAS) in drinking water, food, and other media on a consistent basis is vital for tracking progress and identifying areas that require additional intervention.

Educating the public and raising awareness: In order to enable individuals to make decisions based on accurate information, it is essential to raise public knowledge regarding PFAS, both in terms of their possible health impacts and the methods in which exposure can be minimized.

6. Conclusion

Per- and polyfluoroalkyl substances (PFAS) pose a significant and complex risk to human health, particularly for neonates, infants, and pediatrics, due to their persistence, bioaccumulation, and endocrine-disrupting properties. The presence of PFAS in consumer products, the environment, and biological organisms emphasizes the need to investigate exposure pathways, including placental transfer, breast milk, contaminated water, food, dust, and direct contact with items such as fabrics, diapers, dust, and personal care products . Significant advancements have been made in eliminating legacy PFAS such as PFOA and PFOS; nonetheless, the emergence of new short-chain PFAS and the insufficient data regarding their health impacts remain concerns. The developmental, reproductive, and neurological impacts of PFAS exposure, including cognitive impairments, behavioral issues, and hormone disruptions, highlight the need for specialized therapy, especially for vulnerable populations that are at highest risk. To mitigate risks, it is essential to implement regulations that eliminate hazardous PFAS, regulate alternatives, and establish exposure limits for children. Furthermore, consumer-level initiatives, including public education and the remediation of contaminated sites, are crucial for minimizing exposure. To safeguard public health, it is critical to address data deficiencies by enhancing biomonitoring, establishing standardized methodologies, and conducting comprehensive evaluations of the cumulative and novel impacts of PFAS. A global coordinated effort is required to reconcile the utility of PFAS in industry with the imperative to safeguard human health and the environment from their detrimental impacts.

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Abbreviations

PFAS: Per- and polyfluoroalkyl substances
PFOA: Perfluorooctanoic acid
PFOS: Perfluorooctane sulfonic acid
EDs: Endocrine-disrupting chemicals
ECF: Electrochemical fluorination
AFFF: Aqueous film-forming foam
PFHxS: Perfluorohexane sulfonate
PFNA: Perfluorononanoic acid
PFDA: Perfluorodecanoic acid
TSH: Thyroid-stimulating hormone
T3: Triiodothyronine
T4: Thyroxine
FSH: Follicle-stimulating hormone
LH: Luteinizing hormone
E2: Estradiol
hCG: Human chorionic gonadotropin
OC: Oral contraceptive
MCLs: Maximum contamination levels
MDR: Medical Device Regulation
CMR: Carcinogenic, mutagenic, or reprotoxic

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