PFOA
PERFLUOROOCTANOIC ACID - C8

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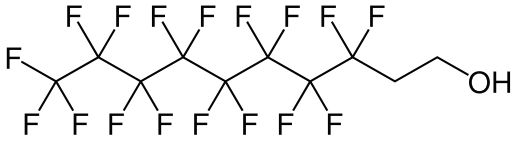
INTRODUCTION

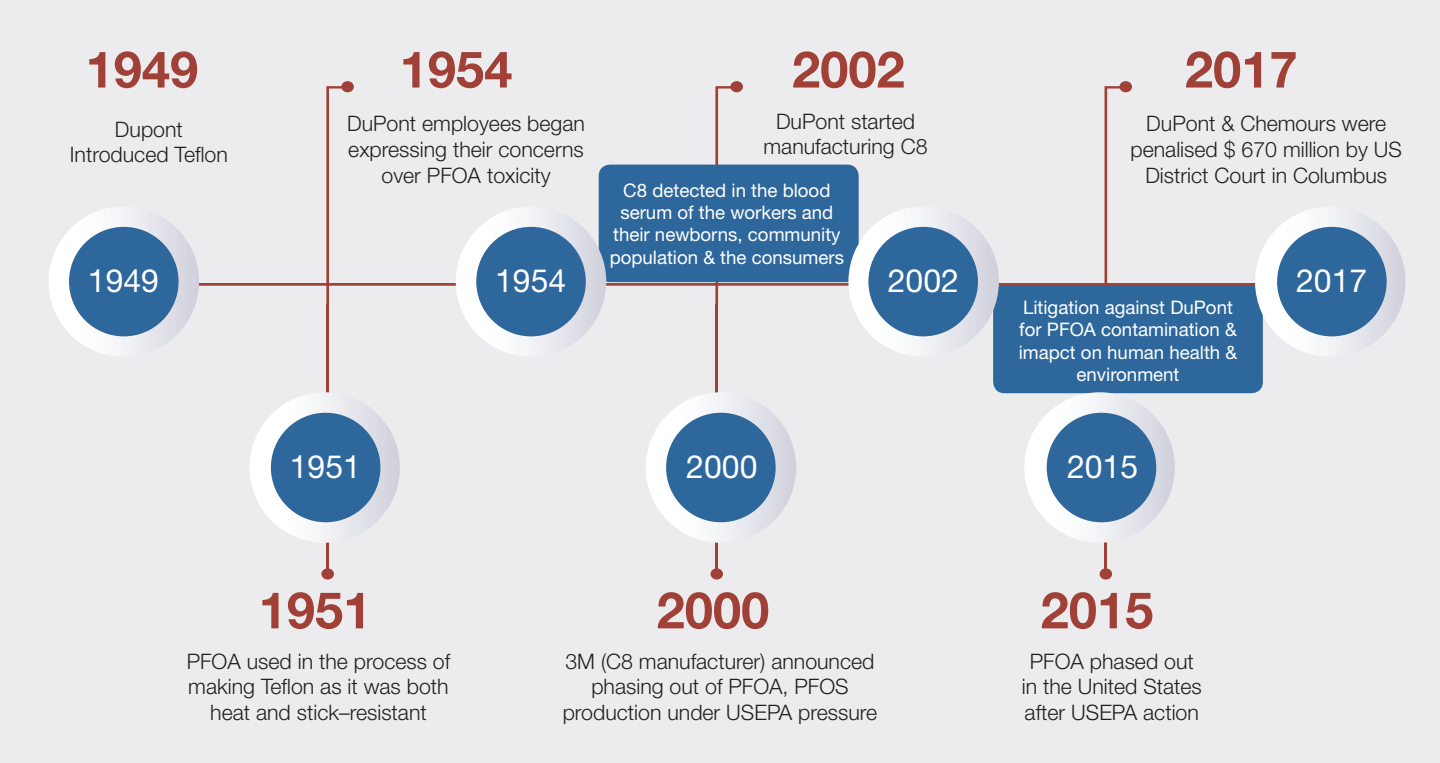
- Perfluorooctanoic Acid (PFOA) including its salts, often referred as C-8, is a man-made chemical of high environmental and human concern.
- The chemical is toxic and persistent in the environment.
- PFOA has the characterstics of a surfactant, exceptional stability and non-reactivity, hence it is generally used for many industrial and consumer products.



PFOA IN STOCKHOLM CONVENTION

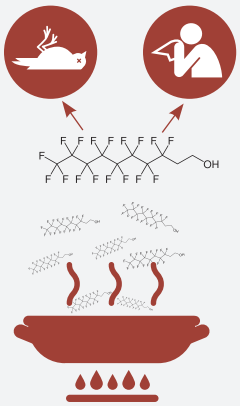
PFOA is non-biodegradable, biomagnifiable and bioaccumulative which can be transported long distance in nature meeting the criteria of Persistent Organic Pollutants (POPs). It has been nominated as POPs in 13th Stockholm Convention POPs Review Committee

JOURNEY OF PFOAs



PRODUCTION AND APPLICATIONS

- PFOA, originated in the US, has been imported by many countries including Europe.
- China is currently the biggest source of import/production of PFOA in the world.
- Total global production of PFOA and its ammonium salt is estimated to 3600–5700 ton in 2004.
- These chemicals are used in a wide variety of consumer products because of their unique repellent (water, grease, oil and soil) and resistant (to heat, friction and chemical agent) properties.
- Though PFOA is a highly toxic chemical, however, no labeling has been required in the products.



Overheating of PFOA coated nonstick cookware pans above ~350 °C (660 °F) detaches the coating and releases byproducts (PFOA) which are harmful to humans and can be lethal to the birds.

EXPOSURE

- Exposure in human body through food-drink intake including drinking water or by exposure to contaminated air, dust and PFOA products.
- Children consume the chemical more than the adults (per unit body weight) because of a higher relative uptake from food and hand to mouth transfer from treated carpets and ingestion of dust.

APPLICATIONS

- Nonstick cookware
- Textiles and leather
- Stain resistant sofas and carpets
- Waterproof clothes and mattresses
- Non-woven medical garments
- Paper & cardboard (e.g. food packaging)
- Firefighting foams
- Wetting agents and cleaners
- Paints and lacquers
- Floor waxes
- Adhesives, etc.

REASONS OF CONCERN: HEALTH AND ENVIRONMENTAL IMPACT

Perfluorooctanoic acid (PFOA) is universally found in the environment. They are released in environment during the production or processing of PFOA and related substances. The chemical has a very long life (92 years) and hence is environmentally persistent resistant to biodegradation, direct photolysis, atmospheric photooxidation and hydrolysis

HEALTH IMPACTS

- PFOA is non-biodegradable and bio-accumulates in human
- WHO suggested PFOA as carcinogenic to humans as well as animals
- PFOA has a long half-life in human plasma averaging 2 to 4 years and the levels increase with age
- PFOA is toxic and gets readily absorbed into the animal body.
- PFOAs is observed to be neurotoxic, immunotoxic and a proven endocrine-disrupting chemical
- The chemical has the ability to cross the placental barrier hence the exposure of these compounds have impact on developing fetus.

- PFOA has been linked with kidney and testicular cancer, ulcerative colitis, rheumatoid arthritis, hypothiroidism (where the thyroid gland does not produce enough thyroid hormone).

HARMFUL IMPACT OF PFOA: A CASE STUDY IN INDIA

An international hair clinic study in India found positive correlation between PFOS concentration in blood and hair loss. An overwhelming 80% individuals consuming food in non-stick cookware were found PFOA positive in their blood compared to 3% of that of the individuals not using non-stick. The study also mentioned that 80% of the cases visiting the clinic with hair fall are PFOA positive. High PFOA levels lead to higher PCOD, hypothyroidism and higher cholesterol and altered lipid levels. All of these indirectly cause hair fall.

PFOAs IN THE ENVIRONMENT

- Due to the physicochemical (persistence and mobility) properties, it is transported into the ground water, surface water, and soil in the vicinity of their original source and even at great distances.
- Water resources (i.e., surface water and ground water) are susceptible to contamination by PFOA released from manufacturing sites, industrial use, fire/crash training areas, and industrial or municipal waste sites where products are disposed of or applied.

TOLERABLE DAILY INTAKE

• European Food Safety Authority (EFSA-2008)	1.5 µg /kg bw/day
• US Environmental Protection Agency (US EPA) developed a Provisional Health Advisory Value	0.4 µg/L
• The Committee on Toxicity of Chemicals in food, consumer products and the environment (COT), Govt. of UK	3 µg /kg body weight
• The federal government of Australia	160 nanograms

PFOA IN THE INDIAN ENVIRONMENT

In India, studies have found the presence of PFOA in the River Ganges and its surrounding surface water bodies and in the River Cauvery and the lakes in and around Chennai.

REGULATIONS AND STANDARDS

- PFOA has been restricted in the USA. Some of the chemical majors, Arkema, Asahi, BASF Corporation (successor to Ciba), Clariant, Daikin, 3M/Dyneon, DuPont, and Solvay Solexis) are committed to phase out PFOA and its salts in their operations by the end of 2015
- Environment Agency, Norway has banned the use of perfluorooctanoic acid (PFOA) in consumer products since June 1, 2014. The ban will apply to solid and liquid consumer products as well as textiles.
- In January 2016, Food and Drug Administration (FDA) announced that it will ban three grease-resistant chemicals (perfluorinated chemicals) from food packaging materials like pizza box liners, microwavable popcorn bags, and sandwich wrappers.
- European Commission and Canada Govt. also have enacted PFOA restrictions of PFOAs in various products.

Presence of higher concentrations of PFOA leads to impaired neurodevelopment in children with lower mental development and memory impairment

GUIDELINE VALUES FOR PFOA IN DRINKING WATER

Country/Agency	Guideline Value (µg/ L)	
	Health-based	Administrative
German	0.3	Composite precautionary guidance value for PFOA+PFOS is 0.1
Health Protection Agency, UK recommended	10	The 'maximum acceptable' concentration
Australia	0.56	-
Danish	0.3	Composite drinking water criteria are based on relative toxicity of PFOS, PFOA, and PFOSA
Swedish National Food Agency	--	Also 0.09 for the mixture of: PFOS, PFOA, PFHxS; PFBS; PFHpA, PFHsA, PFPeA (total PFASs) 0.9: Pregnant women, women trying to get pregnant, and infants should not consume if total PFASs exceeds

Notes: PFOA = perfluorooctanoic acid; PFOS = perfluorooctane sulfonate; PFBS = perfluorobutane sulfonate; PFHpA = perfluoroheptanoic acid; PFHsA = perfluorohexanoic acid; PFHxS = perfluorohexane sulfonic acid; PFOSA = perfluorosulfonamide; PFPeA = perfluoropentanoic acid

ALTERNATIVES

After the health impact of PFOAs came into the limelight, non-PFOA products are being manufactured. The products labeled as PFOAs free are also available in the market.

THE INDIAN CONTEXT

In India, there are few research studies on PFOAs presence in the environment. However, no much public information is available on the health impact of PFOAs. There is also no regulation on the use of PFOA in various products.

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