

# PLASTIC AND HEALTH

Presented by:

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# OVERVIEW

- Health Risks of Plastic Production
- Plastic use and microplastics:  
Invisible health hazards.
- False solutions are not safe  
solutions.



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# HEALTH RISKS OF PLASTIC PRODUCTION

- **Raw extraction:** Crude petroleum refined into petrochemicals is the source of plastic polymers and additives (1). Petroleum extraction and transportation are linked to contaminated groundwater by fracking-process chemicals and air pollution due to excess gas burning in the refining process. (1)
  
- **Plastic manufacture:** The petroleum refining process uses hazardous chemicals, including 1,3-Butadiene, benzene, styrene, toluene, ethane propylene oxide and other additives/byproducts (2)



# HEALTH RISKS OF PLASTIC PRODUCTION

Hazard/Disease agent	Route of Exposure	Port of entry	Health risks
Propargyl alcohol;1,2,4-Trimethylbenzene; Naphthalene; Sodium chlorite and other fracking-process chemicals. (3)	Drinking water contamination due to petroleum fracking and its waste disposal. (3)	Oral exposure (3)	Renal and hepatotoxicity; decreased pain sensitivity; decreased body weight; neuro-developmental effects. (3)
Particulate matter 2.5 (PM2.5), volatile organic compounds (VOCs), and nitrogen oxides (NOx), Sulphur dioxide (SO2), etc. (4)	Air pollution due to combustions and heating in oil refineries. (4)	Respiratory exposure. (4)	Respiratory diseases, cancer-causing agents, developmental and reproductive problems (4)
1,3-Butadiene, benzene, styrene, toluene, ethane propylene oxide and other additives/byproducts in plastic manufacture. (2)	Plastic fumes resulting from plastic additive heating and by-products. (2)	Respiratory exposure. (2)	Vision discomfort, cardiovascular and respiratory diseases, anemia, leukemia, neurological disease, and cancer. (2)

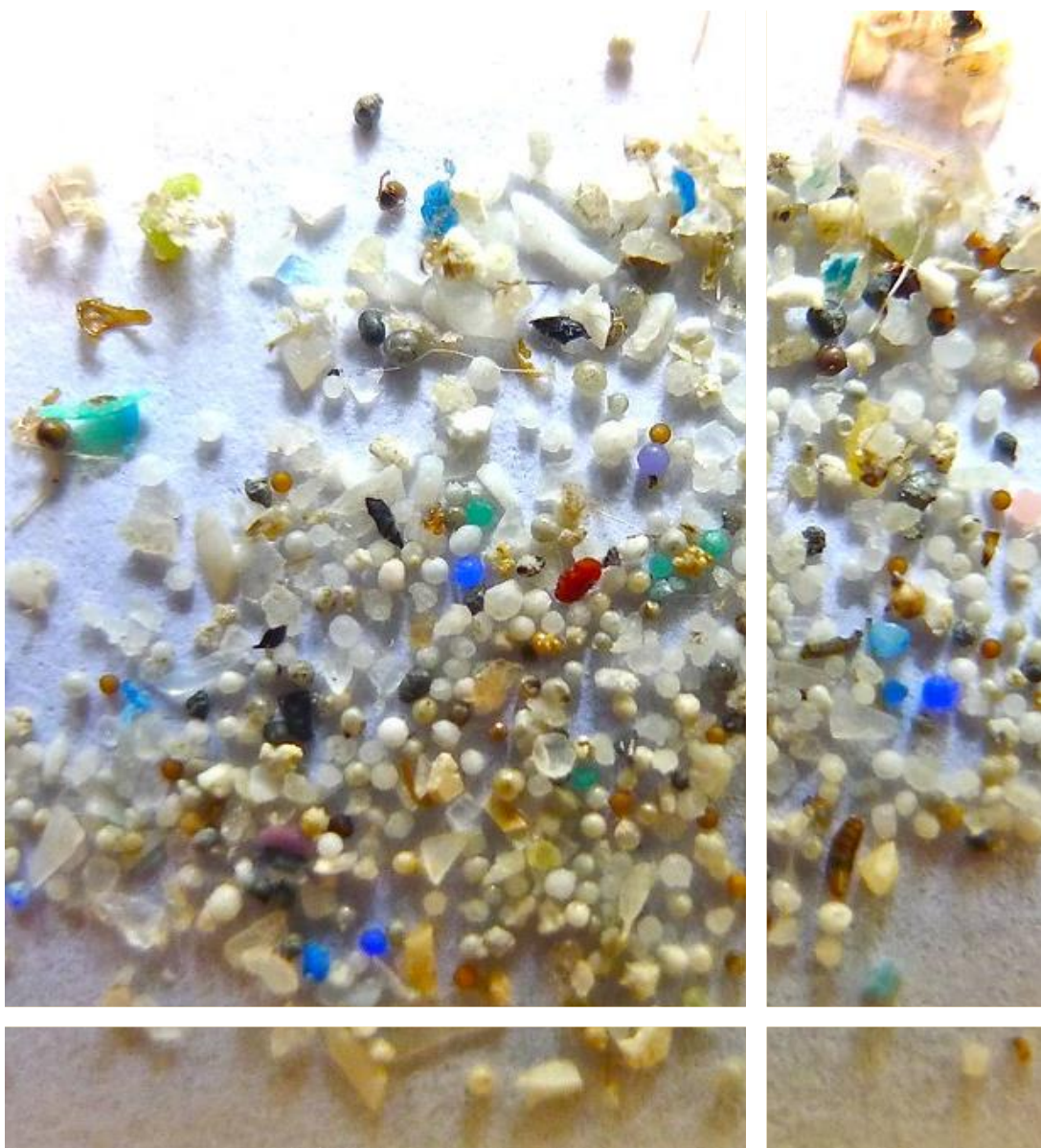


## Case study: Styrene exposure among labourers in the Indian plastic industry

- A study by Sati et al (5) showed that workers exposed to styrene for a minimum of 8 hours per day for more than a year had a reduction in lung volume, lung capacities, and flow rates compared to controls. The exposure was also linked to increased levels of oxidative stress, which can cause potential lung problems.



- PLASTIC USE AND MICROPLASTICS:  
INVISIBLE HEALTH HAZARDS
  - Plastics contain around 10,000 chemicals purposed for antioxidants, lubricants, corrosion inhibitors, plasticisers, adhesives, heat stabilisers, and flame retardants. (6)
  - These chemicals can leach into the surrounding environment, such as water, air, soil and food, due to aging, low pH conditions, UV/light irradiations, microbial degradation, and temperature variation . (6)



## PLASTIC USE AND MICROPLASTICS: INVISIBLE HEALTH HAZARDS

- Plastics can be degraded into microplastics (MPs) of 1.0  $\mu\text{m}$  to 5 mm due to wind, water, abrasion, biodegradation, and sunlight, which are further broken down into nanoplastics (NPs) of 1.0–100  $\mu\text{m}$ . (6)

# HEALTH RISKS OF PLASTIC USE AND MICROPLASTICS

Hazard/Disease agent	Route of exposure	Port of entry	Health risks
Plastic additives: UV-fillers, BPA and phthalates, flame retardants, triphenyl phosphate. Etc. (6)	Food-contact materials that leach into food products or drinking water. (6)  Ingesting microplastics in drinking water and food. (6)	Oral exposure (6)	Endocrine disruption, infertility, obesity, diabetes, breast or prostate cancer, thyroid disorders, increased risk of cardiac problems, growth and cognitive impairment, and neurological disorders (6)
Microplastics	The presence of microplastics in food, drinking water, breastmilk and toothpaste. (7, 8, 9)	Oral exposure (7)	Nausea, vomiting, abdominal pain and other gastrointestinal diseases. (7)



# HEALTH RISKS OF PLASTIC USE AND MICROPLASTICS

Hazard/Disease agent	Route of Exposure	Port of entry	Health risks
Microplastics	Facial/body scrubs, or by shedding of fibers from clothing. (9)	Skin contact (9)	Cutaneous alterations provoke inflammatory responses and disturb the homeostasis of the skin's physiological functions. (9)
Microplastics	Degradation of Indoor objects, materials, and furnishings produces plastic debris. (10)	Inhalation (10)	Inflammation, exacerbate asthma and COPD (10)

# PLASTIC USE AND MICROPLASTICS: INVISIBLE HEALTH HAZARDS



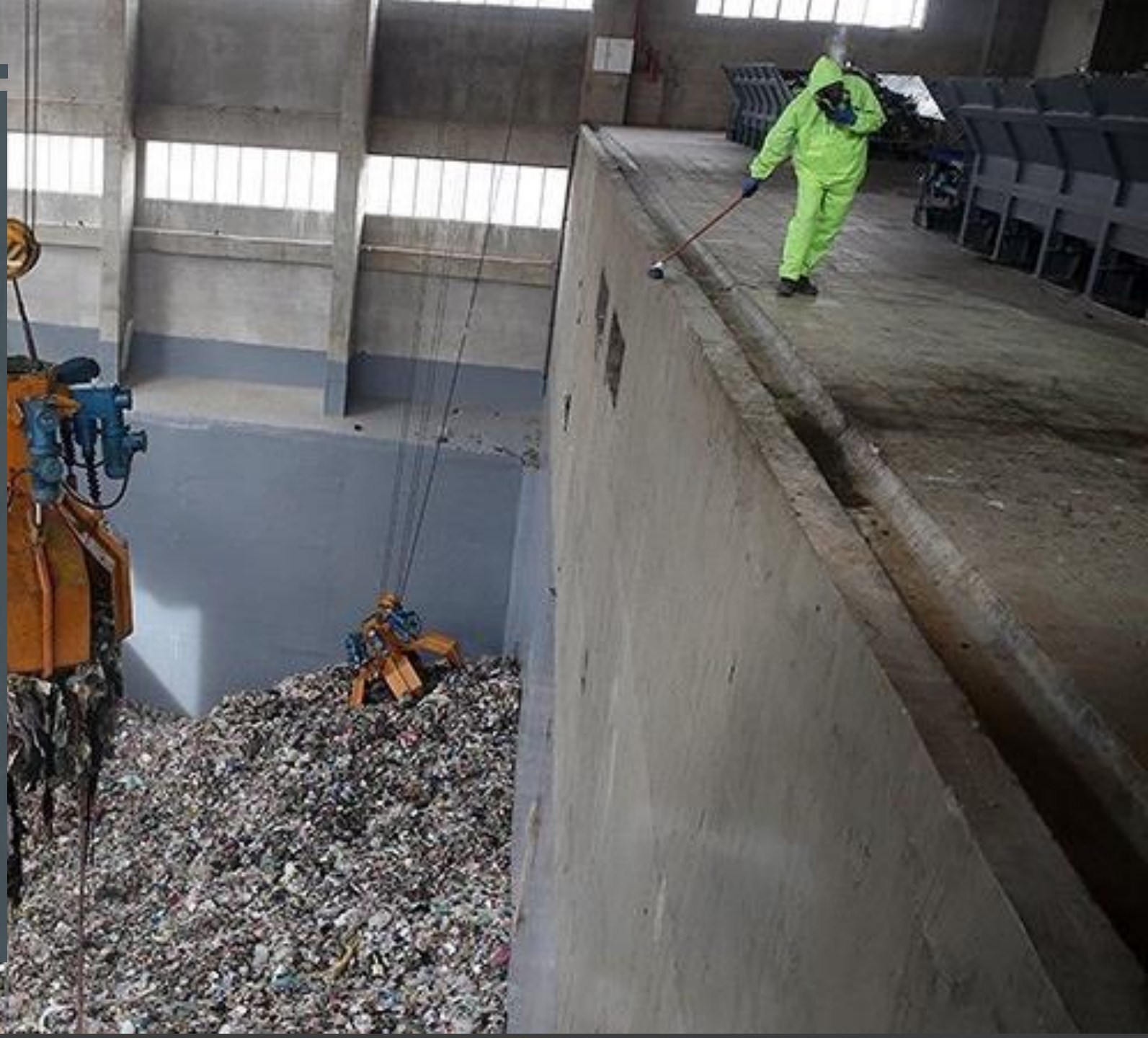
Evidence of microplastics found in the human body:

- Human blood (11)
- Placenta (12)
- Human breast milk (8)
- Seminal vesicles (13)
- Heart (14)
- Lung (15)
- Digestive tracts/human stool (16)

Further health impacts should be investigated.

## FALSE SOLUTIONS ARE NOT SAFE SOLUTIONS

False solutions refer to unsustainable, unsafe, and harmful waste management practices, such as burning or combustion (17). Several terms for this practice include waste incineration, gasification, pyrolysis, plasma, plastic to fuel, waste to energy, etc. (17)



# HEALTH RISKS OF WASTE INCINERATION

Hazard/Disease agent	Environmental Exposure	Port of entry	Health risks
Dioxin and furan (18)	Air, drinking water and food contamination due to waste combustion, especially PVC plastics and in low-temperature (18, 19, 20)	Ingestion, skin contact and inhalation (18)	Non-Hodgkin lymphoma, birth defects, skin lesions and carcinogens. (18)
Heavy metals (18)	Air and food contamination due to waste combustion, the majority found in fly and bottom ashes. (18)	Ingestion, skin contact and inhalation (18)	Skin lesions, neurological disorders, learning disability, or adverse respiratory effects. (18)

# HEALTH RISKS OF WASTE INCINERATION

Hazard/Disease agent	Route of Exposure	Port of entry	Health risks
Particulate matter, and nitrogen oxides (NO <sub>x</sub> ), Sulphur dioxide (SO <sub>2</sub> ), etc. (21)	Air pollution due to waste combustion. (21)	Inhalation (21)	Cardiovascular (ischaemic heart disease), cerebrovascular (stroke) and respiratory impacts. (22)



## CASE STUDY: NON-HODGKIN LYMPHOMA HAS BEEN ASSOCIATED WITH WASTE INCINERATOR EXPOSURE IN FRENCH

- A study by Floret et al. (23) established the relationship between dioxin exposure and non-Hodgkin lymphoma in local residents near waste incinerators compared to the control population. Exposure levels greater than  $0.0004 \text{ pg/ m}^3$  resulted in an odds ratio of 2.3 (95% CI 1.4–3.8).
- Viel et al. (24) identified a low-risk ratio of 1.120 (95%CI 1.002–1.251) for non-Hodgkin lymphoma in local residents living near waste incinerators, although only in females.



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## KEY TAKEAWAYS

- Plastic poses health risks to humans by hazardous chemical exposure:
  - Production: Petroleum extraction and refining.
  - Use: Chemical leach and microplastics.
  - Waste incineration (false solutions)
- Route of exposure: air pollution, drinking water and food contamination, skin contact, and oral care products, from human to human (breast milk).
- Various health risks: respiratory, cardiovascular, and nerve diseases, cancer, etc.

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# THANK YOU

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