

Plastic Pollution, Climate-Change and Carcinogenesis: A Triad of Consequences

Chanda Siddoo-Atwal*

*Moondust Cosmetics Ltd., Canada.

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ABSTRACT

The preponderance of plastic pollution on land and sea has gained recent attention and is a huge ecological problem facing future generations. Plastics are made from fossil fuels and are petroleum byproducts of the oil and gas industry. It has become common knowledge that plastics can break in to microscopic particles or microplastics (less than 5 mm) and the smallest may penetrate plant, animal, and human cells. Presently, the global production average is almost 400 million metric tons per year. It is estimated that 5 billion metric tons of plastics exist in landfills and in the environment and will degrade into tiny fragments or microplastics, which will migrate into living organisms. Research into their environmental effects has revealed some alarming facts. The presence of plastics in sea water is likely to contribute to climate change by releasing greenhouse gases. Microplastics also may interfere with the biogeochemical carbon cycle of phytoplanktons, which absorb carbon dioxide from the atmosphere and replace it with oxygen. Moreover, plastic pollution in the oceans may potentially contribute to species' extinction since sea birds are particularly vulnerable to ingesting floating plastic. Cell culture studies are suggestive that microplastics can produce cytotoxicity, oxidative stress, induce immune responses, alter membrane integrity, and cause differential gene expression - all these cellular effects are associated with carcinogens. Polyvinyl chloride is the third most commonly produced synthetic polymer of vinyl chloride. In 2008, a scientific review by the International Agency for Cancer Research (IARC) concluded that there is sufficient evidence in humans that vinyl chloride causes angiosarcoma of the liver, and hepatocellular carcinoma. More recent molecular studies have revealed vinyl chloride- induced DNA damage in other human tissues could also be associated with cancers of the lymphohaematopoietic system, the lungs, and the brain according to a two-step apoptotic model of carcinogenesis. This raises the vital questions of health consequences for humans and wildlife and long-term environmental implications of the plastics industry.

Keywords: Plastic pollution, Angiosarcoma, Hepatocellular carcinoma, Renal carcinoma, Lymphohaematopoietic cancers, Lung cancer, Brain cancer

Abbreviations: PVC: Polyvinyl Chloride; VC: Vinyl Chloride; VCM: Vinyl Chloride Monomer

Corresponding author: Chanda Siddoo-Atwal, Moondust Cosmetics Ltd., Canada, E-mail: moondustcosmetics@gmail.com

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