Letter to the Editor

“Plastic ocean”: What about cancer?

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Timely appraisals and critical assessments (Kwon et al., 2014; Law and Thompson, 2014; Jambeck et al., 2015; Lusher et al., 2015; van Franeker and Law, 2015) leave no doubt that the rapidly increasing marine plastic pollution poses immense challenges. Toxicological concerns are voiced already (Glausiusz, 2014, Law and Thompson, 2014; Seltenrich, 2015) but an examination of possible links between synthetic polymers and cancers would seem equally important. In this context, at least three questions need to be addressed: (a) Can synthetic monomers contribute to cancer? (b) What about dose–response relationships? (c) What about epidemiological evidence for links between a “plastic ocean” and cancers?

Regarding (a): Reports of experimental links between embedded plastics and tumors in rodents first appeared six decades ago (Oppenheimer et al., 1953), but whether plastic residues can cause or contribute to cancers is surrounded by numerous uncertainties. There are, however, plausible candidate mechanisms such as linking perinatal bisphenol A (BPA) exposures to mammary and prostate cancers as well as hepatic tumors in rodents (Maffini et al., 2006; Acevedo et al., 2013; Weinhouse et al., 2014).

Regarding (b): Factually, plastic residues have “half-lives” of centuries, can bioaccumulate (Seltenrich, 2015) in marine food webs and reach humans. As a consequence, if biologically relevant, we could become – or may already be – challenged by doses that represent critical burdens for public health. Note that the International Agency for Research on Cancer [IARC] classified plastics-associated styrene as possibly carcinogenic [Group 2b] in 2002 (IARC, 2002) and vinyl chloride (PVC, VCM) as carcinogenic [Group 1] in 2012 (IARC, 2012). Note also that proposed causal mechanisms like endocrine or epigenetic disruptions imply that lower doses and in and/or ex utero exposures may be critical instead of exposure-dose conditions examined in plastic production workers.

Regarding (c): Epidemiologically, increases of cancers in marine wildlife were observed (McAlloose and Newton, 2009) and plastic pollution was advocated as a global rather than local contributor candidate (Erren et al., 2009). Data based on observations of plastic production workers as a surrogate for “exposure to plastics” are ambiguous and research on the possible occurrence of cancer in children, adolescents and adults after fetal and/or neonatal exposures to synthetic polymers is lacking.

Overall, Hyatt’s 1869 US patent to manufacture billiard balls using the plastic “celluloid” could be viewed as an environmentally-minded measure as it served to replace elephant ivory for popular cue sports. At that time, no one could have foreseen inasmuch Warhol is already – or will eventually be – right, viz that “everyone is plastic” (Erren et al., 2014).

Importantly, van Franeker and Law (2015) closed their article with the sentence: “The critical question, ‘Where is all the plastic?’ (Thompson et al., 2004), including the uncertainty on impacts, remains unanswered”. In this very vein, today and for many years to come it seems prudent, if not imperative, to pursue studies which can explore the validity of hypothesized links with cancer and/or identify means to reduce plastics in the world within (Erren et al., 2014) and around us (Law and Thompson, 2014; Jambeck et al., 2015).

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References


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