

# Catastrophic Secrets about Plastic Water Bottles Left in Your Car and Store

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**Abstract:** *This paper is going to furnish details about plastic water bottles usually rolling in your car or kept for years in stores. It will provide facts about human exposure to plastic particles leaching to water bottle during extremely hot temperature and the impact of the same on health. In addition to the likelihood of starting fire event if you leave a water bottle exposed directly to sunlight in a car for long period of time. Along with a case study that surveyed the storage condition of plastic water bottles at different stores, as well as expert recommendations in this subject.*

**Keywords:** Plastic water bottle, cancer, Idaho power, fire, car accident

## 1. Introduction

Water plays an essential role to keep us alive, as it maintains body temperature and dispenses oxygen to all cells and organs. Worldwide, only 2.7 percent of water is drinkable, the majority is sea/ocean water, which requires human involvement to desalinate the water, and keep it in containers/plastic bottles. Globally there is a huge demand on water plastic bottles; especially during summer, people are buying them instead of carrying their own refilled water containers, since the plastic bottles are abundantly available and affordable. Sometimes, consumers leave their water bottle in their car for hours to drink it later. Have they ever noticed the expiration date engraved on the plastic water bottles? is water really expired? is it scientifically proven that storing water in plastic containers for long period of time causes cancer in the long term? More than these doubts will be answered in this paper.

## 2. Abbreviations

**BPA:** Bisphenol A.

**FDA:** Food and Drug Administration.

## 3. Background & Facts

Plastic bottles are made from blends of organic polymers, comprising of polyethylene and ethylene. There are different forms of plastic; each has different characteristics, and resin identification code (1-7), which imprinted on each bottle to indicates the general features of the plastic, such as, strength, effectiveness to moisture resistance/barrier and whether it can be easily reused/recycled or not. Figure-A in the appendix provides further information. The chemical compound that is responsible to harden the plastic is called **BPA**, which can be found in polycarbonate plastics that are used in food and beverages containers and epoxy resins that is used as a coating material for the inner side of food cans. Plastic derivatives had been used for decades in many products, such as medical devices, plastic water bottles, food containers etc. At this moment, 90% of people are having a concentration (low - high) of BPA in their body, which

might enter via drinking water, eating cans food consistently, or carried from dust or air inhaled. A study from **FDA** shows that exposure to BPA is safe; subject to level of exposure, stating that a high potential exposure in the long term can cause brain defect, cancer and other health issues. Therefore, the consequences of BPA exposure are not clearly defined, since no remarkable cases proof that the health issue caused because of high exposure to BPA. A Study conducted by Federation of American Societies for Experimental Biology, 2012, shows that while exposing heat to plastic bottles contain water or milk, the amount of BPA leached to water was more than the amount leached to milk. For this reason, this paper focus on water bottles specifically, also because it is always in hands and available with everyone. A study in 2014, stated that after experiment of putting a water plastic bottle in a car under 158 degree Fahrenheit for duration of four weeks, the BPA level leached in the water increased by the time passing, indicating that plastic chemical can be transferred to our food and drink, if heat was one of the factors.

As declared by Breast Cancer Organization, US researchers found that BPA is a weak synthetic estrogen; in other words, act/mimic as an estrogen inside the body, thus there is a high chance to disrupt the normal function of the original estrogen hormone. In addition, the organization declared that in 2011, a study revealed that the pregnant women, whose urine was found with high level of BPA, are more likely to have daughters suffering from hyperactivity, anxiety and depression. This had been noticed in girls having three years old. There is no clear reason why boys are not affected! Beside to what claimed about exposure to plastic products, water bottle can ignite fire if kept in a car under extremely hot ambient temperature. The plastic water bottle is going to act as a focal lens collecting the sunlight hitting the car window. This can easily ignite fire and burn the car-seat upholstery. An experiment had been done, recorded and posted via social media by M/s. (Idaho power, US). It demonstrated about burning two holes in a car seat as a consequence of leaving a plastic water bottle settled on a car seat, exposed directly to sunlight. The original video is available in their channel via YouTube.

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#### 4. Actual Incident

During World Cup Soccer Tournament in 2017, Russian Water Company called (Holy Spring) manufactured in conjunction to the event, water bottles have a shape of soccer ball, which vastly increased the chance to start fire, because of the round surface that is act as a perfect lens to collect and concentrate sunlight more than the regular or conventional plastic bottle. Accordingly, the bottles subjected to recall from all supermarkets after conducting a live practical experiment, proving the same.



**Figure 1:** Ball shape plastic water bottle, manufactured by M/s. Holy Spring, under experiment

Source: <https://sputniknews.com/20180602/russian-combustiblewater-bottles-pulled-1065036639.html>

To avoid fire events, especially during hot sunny day, some people put their water bottle under the seat, to avoid direct focused light beam from the sun. I personally disagree with that action, because water bottle can easily roll around and stuck under brake pedal causing catastrophic accidents. In December 2021, a car accident happened as published by M/s. Lokmat Times, India, one Engineer passed away because a plastic water bottle stuck under the brake pedal, causing a car crashing with a huge truck.

#### 5. Case Study and Experts' Response

I conducted random visits to different super markets and stores to know the storage condition of plastic water bottles. I noticed that not all waters are stored in well-air conditioned areas; on the other hands, some are fulfilling the same. Further, it has been observed that some stores are furnishing the plastic water bottles on shelves for customer purchase, and they are directly exposed to sunlight. The bottles' neck of all exposed bottles show water evaporation sign (small water drops). This indicates that the plastic bottles were stored in a place having wide changes in ambient temperature. This phenomenon differs from one shop to another and not always found. Majority of studies are showing neutral opinion regarding the timeframe of exposing water bottles to sun. Studies might show different results in the future. Hence, for the sake of being always safe avoid keeping your water bottle in the car for weeks and drinking from the same bottle. Also make sure to buy them from a store where maintaining a good ventilation.

#### Exposed directly to sun



**Figure 2:** Water bottles' neck showing vapor (water drops)

From scientific point of view, nothing will happen to you if you take a sip of water kept in a plastic bottle left for weeks in your room or office, knowing that it was directly exposed to sunlight through window. Although experts say that after 12 hrs. of exposure to sun, the carbon dioxide in the ambient air can interact with the water inside the plastic bottle, reducing its PH, thus changing the taste. No major health issue will be encountered unless this water was shared with other person, you might get sick, especially if that person is suffering from any diseases. On the other hand, if you reused the same water bottle for several days, there is a chance for bacteria to travel from your un-washed hand, month or surrounding to the water inside the bottle. According to water defense organization website, USA, M/s. FDA advised that in case of hot countries if the water bottle exposed to sun, the consumer shall keep it for period not exceeding 2 weeks. This timeframe is extendable in case of cold countries to one year.

At the same time, experts are not tolerating by their response against keeping your water bottle in a car and drink from it gradually day after day, till finish it. Expert's emphasis on the density of BPA in a water, since it is a hormone disruptor, which revealed that it is linked to serious health issues like heart diseases and cancer. In addition, they stated that if you are storing high quantity of water bottles at your home, make sure you are maintaining appropriate ambient temperature, and avoid storing them for more than one year. Because chlorine intensity will be decreased by the time, leading to bacteria to start growing up, keeping in mind that chlorine intensity will decrease further faster in case storing water bottle in extremely hot place.

#### 6. Recommendation for Alternatives

In continuation to what experts stated, there are useful

recommendations to be highlighted. Carrying water bottle with you is necessary; however, there are other alternatives or techniques to be taken into consideration if you want to be safe. If you are having the habit of forgetting your water bottle in the car, you may replace it with squeezable bottle, the same allotted to bicycle riders, because these bottles are usually made of low-density polyethylene (medical grade plastic). Hence, BPA leaching issue is not applicable to these bottles. Although FDA announced that it is acceptable to be exposed to BPA if the level of exposure is low, however it is highly recommended to use stainless steel bottle in case you are going out of home for long time. Further to previous, if you are a person who cannot use other alternatives of plastic bottle, make sure before leaving your bottle at car that you cover the window with sunshade cover or else putting your water bottle in a car cooler bag.

## 7. Conclusion

To end with, keeping a plastic water bottle in the car for few minutes or hours will not harm your health. High consideration shall be seriously taken if the plastic water bottle is kept in the car for many weeks during hot weather. Another area to consider is your habit while handling the water bottle, if you can replace it with other alternatives it would be more effective and safer, because till date no certain study clearly states whether any of the recent health issues having a direct linkage with daily exposure to plastic, especially drinking a water kept in a plastic container for weeks! Another area has to be further studied is other drinks that are kept in a plastic bottle like milk and acidic juices. BPA leaching into plastic bottle may have different effect.

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## Author Profile

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Appendixes

RECYCLED IN ACT	CODE	PLASTIC TYPE	DESCRIPTION	EXAMPLE
	1 PETE	Polyethylene Terephthalate PET	Clear, tough, solvent resistant. Used for rigid sheets and fibres.	Water bottles, soft drink bottles, fruit juice bottles, fruit punnets and plastic meat trays.
	2 HDPE	High Density Polyethylene HDPE	Hard to semi-flexible, waxy surface, opaque.	Cloudy milk bottles, bleach bottles, laundry bottles.
	3 v UPVC	Unplasticised Polyvinyl Chloride UPVC	Hard rigid, can be clear, can be solvent welded.	Clear cordial, liquid soap bottles and fruit juice bottles.
	4 LDPE	Low Density Polyethylene LDPE Linear: LLDPE	Soft, flexible, waxy surface translucent, withstands solvents.	Plastic bags, garbage bags, squeeze bottles, chip packets, plastic wrap, black irrigation tube.
	5 PP	Polypropylene PP	Hard, flexible, wide property range for many applications, good chemical resistance.	Bottles, caps and rigid packaging like margarine containers, icecream containers and yoghurt pots.
	6 PS	Polystyrene PS	Clear, glassy, rigid, brittle, opaque semitough, melts at 95°C. Affected by fats and solvents.	Coffee cup lids, plastic cups, clamshells, coat hangers, medical disposables, some yoghurt & dairy containers.
	7 OTHER	Expanded Polystyrene EPS	Foamed, light weight, energy absorbing, heat insulating.	Foam packaging, packing peanuts, styrofoam boxes.
	7 OTHER	<b>OTHER</b> : includes all other resins and multi materials of unknown composition, acrylic, nylon, polyurethane (PU), polycarbonates (PC) and phenolics.		Automotive, aircraft and boating, furniture, electrical and medical parts.

Figure A: Plastic Identification Code.

Source: [https://www.cityservices.act.gov.au/\\_\\_data/assets/pdf\\_file/0010/1325773/ACTNOWaste-Plastic-Codes-Factsheet-v3.pdf](https://www.cityservices.act.gov.au/__data/assets/pdf_file/0010/1325773/ACTNOWaste-Plastic-Codes-Factsheet-v3.pdf)