

Are the Myths About Polycarbonate Bottles True? New Information Supports the Safe Use of Polycarbonate Bottles

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Summary

For decades, polycarbonate plastic has been safely used to make baby bottles and reusable water bottles. The safety of these products has been supported by numerous science-based safety evaluations of bisphenol A that have been conducted by independent government and scientific bodies worldwide. For example, recent evaluations by the European Food Safety Authority and NSF International both provide strong support for the safety of polycarbonate bottles. In spite of this strong scientific support, numerous myths, misinformation and scare stories about polycarbonate bottles continue to circulate. Several new studies have carefully examined these myths and provide additional strong support for the safe use of polycarbonate bottles.

What Do We Know About the Safety of Polycarbonate Bottles?

Polycarbonate plastic has been the material of choice for baby bottles and reusable water bottles for decades because it is lightweight, highly shatter-resistant, and transparent. During that time, many studies have been conducted to assess the potential for trace levels of bisphenol A to migrate from polycarbonate bottles into foods or beverages. The conclusions from those studies and comprehensive safety evaluations by government bodies worldwide are that polycarbonate bottles are safe for use.

Nevertheless, myths, misinformation and scare stories about polycarbonate bottles continue to circulate, in particular regarding real-life conditions of use that are claimed to result in the release of harmful levels of bisphenol A. Several new studies from respected scientists and organizations are now available to clarify whether any of the myths are true and whether the scare stories have merit.

What Are the Myths and What New Information is Available?

Myth #1: Migration Increases to Unsafe Levels at High Temperatures

A recent scare story,¹ based on a small-scale study from the University of Cincinnati, claimed that the level of bisphenol A released from polycarbonate plastic bottles increased when the bottles were filled with boiling water, and remained elevated when the bottles were subsequently filled with water at room temperature.

Increased migration into boiling water is not news at all since it is well known as a general phenomenon that migration levels increase with increasing temperature.

The claim that bisphenol A migration levels remain elevated after a single treatment with boiling water was not confirmed in a far more comprehensive study² from researchers at the University of Athens who examined migration over repeated cycles to determine what happens under real-

From <http://www.bisphenol-A.org>

life repetitive use of polycarbonate bottles. These researchers found that elevated migration levels are a transient effect that quickly recedes to a baseline level with continued use, even when boiling water was used in each subsequent cycle.

Even the highest levels of bisphenol A observed in these new studies are well below science-based safety standards set by government bodies.

Myth #2: Microwave Heating Leads to Elevated Migration Levels

The myth that heating baby bottles in a microwave oven increases migration of bisphenol A to unsafe levels was tested in a study published in 2008 by TNO, a prominent Dutch research organization.³

In TNO's study, polycarbonate baby bottles from eighteen different brands sold in Europe were subjected to a series of tests to determine the level of bisphenol A that migrates under real-life microwave heating or sterilizing conditions. Bottles were filled with water, heated to boiling with microwave heating, boiled for one minute, and cooled. The procedure was then repeated two more times for each bottle after rinsing, and bisphenol A was measured in the water from each cycle.

As expected, the study demonstrates that microwave heating has no effect on migration of bisphenol A from polycarbonate bottles. This study indicates that microwave heating can be safely used to either warm the contents of a polycarbonate bottle⁴ or to sterilize the bottles. Migration levels measured in this and earlier studies using other modes of heating are all well below science-based safety standards set by government agencies.

Myth #3: Cleaning Polycarbonate Bottles in a Dishwasher is Unsafe

This myth suggests that polycarbonate bottles will degrade if cleaned in a dishwasher, leading to the release of unsafe levels of bisphenol A in subsequent uses of the bottle. The myth originated in a study from 2003 in which laboratory animal cages and water bottles were inadvertently washed at high temperature with a highly caustic floor cleaning detergent and then autoclaved,⁵ conditions that are of little relevance to actual use of polycarbonate bottles in the home.

Researchers from the Norwegian Food Safety Authority and the Official Food Control Authority of the Canton of Zürich, Switzerland recently conducted a very comprehensive set of experiments designed to assess whether any real-life dishwashing condition, "even rather improbable conditions and scenarios," could lead to bisphenol A levels above safety standards.⁶ Based on the data, they concluded "that even under extreme conditions and scenarios the amount of BPA released from polycarbonate baby bottles is clearly below the TDI [Tolerable Daily Intake; a European science-based safety standard] for babies."

Under normal dishwashing conditions, which includes effective rinsing to remove detergent, the migration levels noted in this study are typical of what has been observed in many earlier studies and are far below science-based safety standards. This study, as well as a number of others, confirms that polycarbonate baby bottles can be safely cleaned in a dishwasher.

From <http://www.bisphenol-A.org>

Myth #4: Old or Scratched Bottles May Release Unsafe Levels of Bisphenol A

A corollary to this myth, which asserts that old bottles have degraded and will release unsafe levels of bisphenol A, is that polycarbonate bottles should not be cleaned with a brush. However, recent studies have provided no support for this myth.

The University of Athens study noted above² examined the effect of dishwashing, brushing with a detergent, sterilizing with boiling water and temperature on migration of bisphenol A from polycarbonate baby bottles. With the well-known exception of temperature, these experiments found no effect from any of the other parameters on release of bisphenol A. Migration levels in heated baby bottles were well below science-based safety standards and, accordingly, the authors concluded “Our results suggest that BPA migration from polycarbonate baby bottles is unlikely to be of concern.”

Although small in scale, the University of Cincinnati study noted above¹ found no difference between old and new polycarbonate water bottles. Migration of bisphenol A from old bottles, up to nine years old, was not different than levels measured from new bottles.

What Does the New Information Tell Us About Polycarbonate Bottle Safety?

The conclusions of comprehensive evaluations of the safety of bisphenol A conducted by independent government and scientific bodies worldwide have, in every case, supported the safe use of polycarbonate baby bottles and water bottles. Contrary to the myths, misinformation and scare stories about the safety of polycarbonate baby bottles and water bottles, the new studies described above provide additional strong support for these conclusions.

For example, the European Food Safety Authority (EFSA) recently established a Tolerable Daily Intake (TDI) for bisphenol A of 50 micrograms/kilogram bodyweight/day, which represents a safe level for daily exposure over a lifetime.⁷ Even the highest transient level of bisphenol A measured in the University of Athens and University of Cincinnati studies, which would not occur daily over a lifetime, would only result in bisphenol A exposure that is less than 1% of the TDI.

More recently, NSF International, a not-for-profit public health organization, published their comprehensive evaluation of the safety of bisphenol A, which concluded with the calculation of a Reference Dose (i.e., safe exposure level) and a Total Allowable Concentration (i.e., safe concentration)⁸ for drinking water. Both of these values are applicable to daily exposure over the course of a lifetime. Very similar to the EFSA evaluation, even if the highest transient level of bisphenol A measured in the recent migration studies was experienced every day, exposure to bisphenol A would still be far below the Reference Dose and Total Allowable Concentration.

A complete review of the scientific data, as has been conducted by government and scientific bodies worldwide, reveals that polycarbonate bottles are safe for use and that migration levels of bisphenol A from polycarbonate plastic under real-life conditions are well within science-based safety limits.

From <http://www.bisphenol-A.org>

¹ See <http://www.bisphenol-a.org/whatsNew/20080131.html> for a full summary and discussion of the new study and scare story.

² Maragou, N. C., Makri, A, Lampi, E. N., Thomaidis, N. S., and Koupparis, M. A. 2008. Migration of bisphenol A from polycarbonate baby bottles under real use conditions. Food Additives and Contaminants. In press.

³ Ehlert, K. A., Beumer, C. W. E., and Groot, M. C. E. 2008. Migration study of bisphenol A into water from polycarbonate baby bottles during microwave heating. Food Additives and Contaminants. In press.

⁴ Because of uneven heating and the formation of hot spots, experts do not recommend heating in the bottle to warm infant formula or milk.

⁵ Koehler, K. E., Voigt, R. C., Thomas, S., Lamb, B., Urban, C., Hassold, T., and Hunt, P. A. 2003. When disaster strikes: rethinking caging materials. Lab Animal. 32(4):24-27.

⁶ Biedermann-Brem, S., Grob, K., and Fjeldal, P. 2007. Available from the Norwegian Food Safety Authority website at http://matportalen.no/artikler/2007/11/taateflasker_av_polykarbonat_er_trygge_i_bruk.

⁷ A summary report and full report are available on the EFSA website at http://www.efsa.europa.eu/en/science/afc/afc_opinions/bisphenol_a.html. A discussion of the EFSA report and other recent evaluations of bisphenol A is also available at <http://www.bisphenol-a.org/whatsNew/20070201EFSA.html>.

⁸ Willhite, C. C., Ball, G. L., and McLellan, C. J. 2008. Derivation of a bisphenol A oral reference dose (RfD) and drinking-water equivalent concentration. Journal of Toxicology and Environmental Health, Part B. 11(2):69-146.