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Science 2.0

BPA Causes Miscarriages (Or So The Headlines Say)

http://www.science20.com/steve_hentges/bpa_causes_miscarriages_or_so_headlines_say-122721

It was the late astronomer and author Carl Sagan who popularized the phrase “extraordinary claims require extraordinary evidence,” and originated the closely related concept of [scientific skepticism](#).

In the case discussed here, skeptics we should be.

Last week we saw a flurry of media articles with headlines suggesting that exposure to the common chemical bisphenol A (BPA) increases the risk of miscarriage. Considering how much research has been conducted on BPA already, in particular extensive research on laboratory animals that examined the potential for BPA to cause any effect on reproduction, that’s a rather extraordinary claim that has not been corroborated or replicated.

Never mind that the source of the headlines was a study that has not been peer-reviewed and published in the scientific literature. And never mind that this is a very small scale study that is not suitable for establishing cause-effect relationships. Journalists love a good scare story and headline writers excel at scaring the dickens out of unsuspecting readers.



Unpublished, non-peer-reviewed claims about small samples make for good headlines, but terrible science. Credit and link: [Web Pro News](#)

Beyond the media articles, [the only information available on the study is a short conference abstract](#).

But even just the slim abstract is enough to set off alarm bells inside the head of any scientific skeptic. The study involved collecting single spot samples of blood for analysis of BPA from 114 pregnant women at 4-5 weeks of gestation. The detected levels were then statistically associated with pregnancy outcome (i.e., live birth or miscarriage) and the results presented in terms of relative risk for miscarriage.

On the surface this might appear to be a reasonable study to inform on potential risk factors for miscarriage, but several critical aspects are apparent from the abstract alone that indicate otherwise. The most important aspect is whether measurement of BPA in blood, as done in this study, is a valid measure of exposure. If not, any statistical associations with the BPA data will also be invalid.

There is growing awareness in the scientific community that ultra-trace analysis of BPA in blood is not a reliable method for epidemiological studies. Very recently, [a highly qualified group of researchers published a letter to the editor in response to another recent epidemiological study](#) that relied on measurement of BPA (and other compounds) in blood. Notably, the authors include respected scientists from CDC (individually and institutionally considered to be a preeminent expert in biomonitoring), NIEHS (which provided the grant funding for the study discussed in this article), an environmental group (with extensive experience in trace level analysis of chemicals), and eight other well-known scientists with extensive biomonitoring or epidemiological experience.

For the reasons discussed in their letter, they succinctly stated: “it is seldom possible to verify that serum concentrations of these compounds [specifically referring to BPA] are valid measures of exposure.” One of the reasons cited by these authors is the potential for sample contamination from iatrogenic sources such as collection devices and clinical apparatus, which certainly would be a concern in the clinical setting for this study.

A second reason is that BPA is well-known to have a short half-life in the body of only a few hours, meaning that BPA levels in blood, [as well as in urine where BPA is eliminated](#), will vary considerably over short periods of time, over the course of a day and between days. This has [been clearly demonstrated in a recent human study in which BPA was tracked over time in the blood and urine of volunteers](#) who were fed meals enriched in foods likely to contain trace levels of BPA. Accordingly, measurement of BPA in single blood or urine spot samples is unlikely to provide reliable exposure information for epidemiological studies.

Since the study itself is incapable of establishing a cause-effect relationship, another way to assess the likelihood that the reported statistical association is biologically meaningful is to examine the biological plausibility of the finding. Of particular relevance here are the multiple multi-generation studies in laboratory animals that have been conducted on BPA to determine whether BPA has any potential to affect reproduction or development.

The results of these comprehensive [studies consistently show that BPA does not affect reproduction](#), and in particular does not affect reproduction at any dose even remotely close to typical human exposure levels. Confidence in the validity and generality of these findings is high since the studies have been conducted on at least two strains each of rats and mice, which avoids the hypothetical possibility that one species/strain is somehow insensitive.

Even though the statistical association reported in the study may have no biological meaning at all, it also is not clear that the finding has any generality. It is known that miscarriage terminates approximately 25% of pregnancies, but the miscarriage rate in this small study population was

approximately 60% (68 miscarriages out of 114 pregnancies), which suggests there is something very unusual about the cohort under study.

The miscarriage rate might even be understated since it only reflects miscarriages that occurred after 4-5 weeks of pregnancy, after which the rate of miscarriage should normally be less than 25%. This large discrepancy indicates that the cohort is not representative of the general population of pregnant women, and also suggests that unidentified confounders might be influencing the results.

So, is the exceptional claim in the headlines backed up by exceptional evidence? In a word – no. The evidence doesn't support the claim that BPA causes miscarriage, even in this small study population, and a healthy dose of skepticism is well warranted.