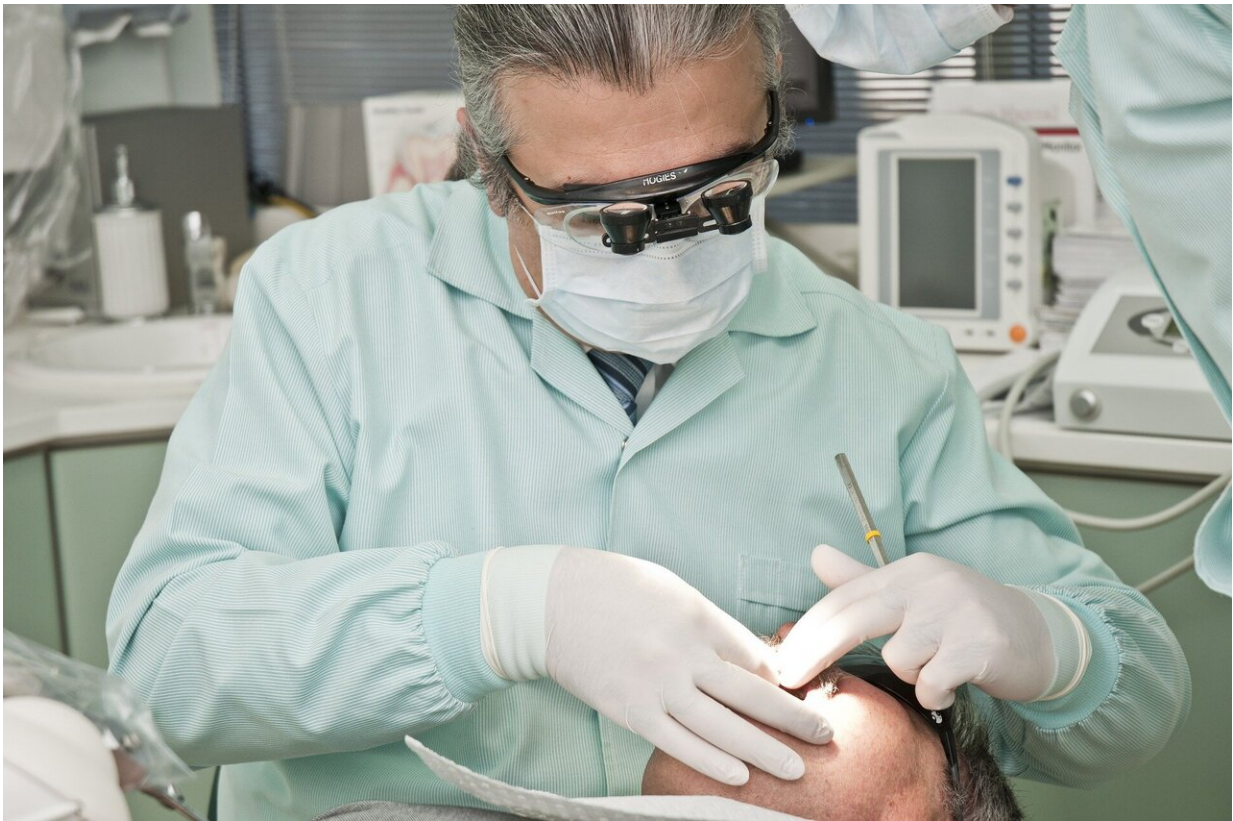


3-D printing resins in dental devices may be toxic to reproductive health

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Two commercially available 3-D-printable resins, which are marketed as being biocompatible for use in dental applications, readily leach compounds into their surroundings. These compounds can induce severe

toxicity in the oocyte, the immature precursor of the egg which can eventually be fertilized, reports a new Northwestern Medicine study in mouse oocytes.

The research team made this unexpected discovery while validating the use of commercially available resins to 3-D print materials to culture [reproductive cells](#).

"Our results are important because they demonstrate leachates from commonly used materials in 3-D printing slated as 'biocompatible' but may have adverse effects on [reproductive health](#)," said Francesca Duncan, co-corresponding author of the study and assistant professor of obstetrics and gynecology at Northwestern University Feinberg School of Medicine. "There is a critical need to better understand the identity and biological impact of compounds that leach from these materials."

The final study was published in the journal *Chemosphere* on January 26.

While there have been a few previous studies investigating potential toxicities due to exposure to 3-D-printed materials, there have been no studies investigating the potential reproductive toxicities induced by these materials in mammalian models.

"Despite the revelations surrounding BPA almost 20 years ago, it is still rare that the potential impact new materials may have on reproductive health are rigorously and systematically studied despite their ubiquitous nature in our day-to-day lives," Duncan said.

The clear tooth aligner market that uses resins such as Dental SG (DSG) and Dental LT (DLT) has become a multi-billion-dollar business in recent years, Duncan said, with some companies utilizing 3-D-printing techniques in manufacturing due to their ability to rapidly produce products.

Duncan and colleagues characterized the leachates of the resins using mass spectroscopy and identified Tinuvin-292, a commercial light stabilizer that is commonly used in the production of plastic materials.

The results of this study potentially reach well beyond just the 3-D-printing space however, Duncan said, because Tinuvin-292 is a common additive used in the production of many different types of plastic consumer products.

But even beyond dental applications, 3-D-printed materials are being used more often due to recent technological advancements that make them easy to produce.

While the results of the study only provide evidence for egg toxicity of these materials in an in vitro setting, whether there are possible in vivo effects need to be further examined, scientists said. This is especially the case for DLT resins, which are intended for making oral retainers that must stay in one's mouth for long periods of time, leading to extended exposure in the body.

"The results demonstrate reproductive toxicity should be a priority when characterizing all materials humans may come into contact with either in a medical setting or in their day-to-day lives," Duncan said.

In terms of next steps, scientists plan to investigate whether in vivo exposures to DSG and DLT resins have egg toxicity similar to what occurs in vitro, examine whether there are sex differences in reproductive toxicity in response to DSG and DLT and examine the human exposure levels to Tinuvin 292.

More information: Hunter B. Rogers et al, Dental resins used in 3D printing technologies release ovo-toxic leachates, *Chemosphere* (2020). [DOI: 10.1016/j.chemosphere.2020.129003](https://doi.org/10.1016/j.chemosphere.2020.129003)

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