

Alcohol consumption can cause too much cell death, fetal abnormalities

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Dr. Erhard Bieberich, biochemist in the Medical College of Georgia Schools of Medicine and Graduate Studies. Credit: Medical College of Georgia

The initial signs of fetal alcohol syndrome are slight but classic: facial malformations such as a flat and high upper lip, small eye openings and a short nose.

Researchers want to know if those facial clues can help them figure out how much alcohol it takes during what point in development to cause these and other lifelong problems.

They have good evidence that just a few glasses of wine over an hour in the first few weeks of fetal life, typically before a woman knows she's pregnant, increases cell death. Too few cells are then left to properly

form the face and possibly the brain and spinal cord.

"It's well known that when you drink, you get a buzz. But a couple of hours later, that initial impact, at least, is gone," says Dr. Erhard Bieberich, biochemist in the Medical College of Georgia Schools of Medicine and Graduate Studies. "But, your fetus may have experienced irreversible damage."

He thinks the damage results from the death of neural crest cells, versatile cells that travel a lot during development, ultimately helping form bone, cartilage, connective tissue, the heart and more. These cells are developing at the same time as neural tube cells that form the brain and spinal cord. Consequently, the telltale facial abnormalities in a newborn also may foretell problems with learning, memory, vision, hearing and more.

Some cells need to die during development. "There is always a very delicate balance between newly formed cells and dying cells," says Dr. Bieberich. "It's a very active period of that balance, because usually you develop a surplus of tissue then later melt it back down to acquire a specific shape." He likes to use the hands as an example of critical melting. "The digits form because the inter-digital tissue dies. If it did not die, we would have paddles instead of hands with fingers."

Cell death likely results from alcohol disturbing the metabolism of the lipids that help the hollow wad of stem cells that forms in the first day of life find direction and purpose, he says.

A grant from the March of Dimes, whose mission is to prevent birth defects and infant mortality, is enabling him to compare cell loss in mice following different levels of alcohol consumption to the usual loss that occurs in development.

His focus is these neural crest cells, which help form the upper part of the skull. Some neural crest cells stay in the brain and, early on, these cells share growth factors with neural tube cells. Cognitive and other brain damage is hard to quantify this early, but mice missing the neural crest gene also experience problems with skull and brain development.

Ideally his measurements will give women a better idea of the risk of alcohol consumption and point toward a way to reduce the damage. "You have to make people aware of the science behind the risk," Dr. Bieberich says. "We are not saying that every pregnant woman who drinks three or four glasses of wine in a short period will have a baby with birth defects, but it elevates the risk."

Source: Medical College of Georgia

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