The much-hyped study didn't actually test vitamin B3 supplementation in humans. from www.shutterstock.com

Reports on a new study claim supplementation with vitamin B3 during pregnancy could prevent miscarriages and birth defects.

So should all pregnant women start taking B3 supplements? Not so fast. While this is an interesting and well-done study, the researchers didn't actually give vitamin B3 to any humans, so we need a lot more information before we can recommend it.

What the study found

The study identified genetic causes of a rare type of birth defect called "VACTERL association". VACTERL stands for vertebral defects, anal atresia (problems with the tissue closing the anus), cardiac defects, tracheo-esophageal fistula (an abnormal connection between the windpipe and the foodpipe), renal anomalies (kidney defects), and limb abnormalities. Affected babies have anomalies in at least three of these.

US statistics show about one in 10,000-40,000 babies are affected by VACTERL association and some of these babies die. There are about 310,000 babies born in Australia each year.

The study authors looked at the genes of 13 families affected by this type of birth defect. For the defect to be passed on to offspring it has to be present in both parents' genes - if it's only present in one gene the other healthy one will compensate.

They pinpointed the variations in two genes responsible for these defects in four of the families. These two genes play a role in making "nicotinamide adenine dinucleotide" or NAD, which helps cells make energy out of glucose. NAD also assists in repairing DNA

. NAD is synthesised in the body from tryptophan, an amino acid, or from niacin, also known as vitamin B3.

Read more: ***Why we don’t know what causes most birth defects***

Then the authors genetically engineered mice and deleted these genes. They found that without them the mice had NAD deficiency, and similar malformations in their offspring.

However, when they provided extra niacin to pregnant mice, the pups were relatively normal despite the absent gene.

What does this mean?

This does NOT mean that taking niacin/vitamin B3 in pregnancy prevents miscarriages and all birth defects.

It means that high levels of niacin in pregnancy compensates for defects in the two selected genes, and prevents *mice* from experiencing miscarriage and birth defects in offspring. The paper does not report on human miscarriage or on malformations in human organs. The study did not supplement pregnant women with vitamin B3, or with anything else.

There have been previous studies showing mutations in other genes are also associated with VACTERL and it’s likely that different genes contribute to these malformations. Not all babies with VACTERL will have the same mutations.

But it’s important we understand the role of different genes in birth anomalies and this paper has not only identified genetic mutations in two genes, but also the mechanism by which they cause them and an easily obtained potential remedy for these cases.

Several B vitamins are related to birth defects.from www.shutterstock.com

Other causes of miscarriage

A large number of genes when deleted in mice have been shown to cause miscarriage and malformations. Many of these are not involved in the NAD pathway. Most have not been associated with human miscarriage but a few may be.

For example, deficiency in an immune system molecule (cytokine) called “GM-CSF” has been shown to cause miscarriage and defects in the placenta in mice. Addition of this molecule to IVF embryos prevents miscarriage in mice and in humans prevents miscarriage in high-risk women (those who have previously had a miscarriage following IVF). This is but one example unrelated to NAD.

Can supplements prevent birth defects?

From 1986-2007, 5.9% of South Australian births (so 590 out of 10,000) were complicated by congenital malformations, most of which were not severe or life threatening. The most common malformations are in the urinary and genital systems (164/10,000 births) and the cardiovascular system (119/10,000) and range from mild to severe life-threatening malformations requiring extensive surgery.

For many of these there is no known cause nor remedy. For neural tube (brain and spine/spinal cord) defects such as spina bifida (which occur in 16 in 10,000 births), maternal supplementation with folic acid from one month before conception and in the first trimester of pregnancy has been shown to reduce their incidence .

The Australian population is not considered to be deficient in niacin . Most breakfast cereals have niacin added to them as do some flours for baking; it is also present in meat, green vegetables and whole grain cereals.

A 2010 study in California showed that in women who did not use micronutrient supplements in pregnancy, low dietary intakes of folate, niacin, riboflavin, and vitamins B12, A and E were associated with one specific major heart defect but not another. So not one, but a number of micronutrients are involved in birth defects, notably several B vitamins.

Not all of the reports are backed by the science. Screenshot, victorchang.edu.au

Clearly, folic acid supplementation to prevent neural tube defects has been successful, but emerging evidence suggests a potential downside . Specifically, the babies of women who supplemented with folic acid in late pregnancy were more likely to have persistent asthma in early childhood.

Since 2009 we've had mandatory fortification of flour for bread-making with folic acid in Australia and New Zealand. Together with folic acid supplementation in pregnancy, pregnant women are getting high amounts of folic acid. Given folate plays a part in gene expression (the process by which information from a gene is used), it's possible too much may not be a good thing. But we're yet to see hard evidence of this.

This new study is scientifically excellent and the authors have great credentials. But media reports, and the research institution itself , have made claims not supported by the science. Whether niacin is useful in human miscarriage has not been studied. The birth defects studied in the paper are rare and whether the findings apply to others is yet to be determined.

So potential parents need to be aware that, no, we have not found a way to prevent miscarriages and birth defects. And potential mothers should not start supplementing their diets with high levels of vitamin B3 because it hasn't been tested in humans, and we don't know what effects it will have.

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