Can microplastics in blood vessels raise the risk of heart attack and stroke?

We go behind the headlines to fact check stories claiming that tiny pieces of plastic in blood vessels may increase the chance of having a heart attack or stroke.

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The idea that tiny plastic particles, so small that they mostly cannot be seen by the human eye, can enter the human body from the air, food and water is not new, with many studies on microplastics and human health <https://www.science.org/doi/10.1126/science.abe5041?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%200pubmed> showing this is the case.

Past studies on human cells and animals in the lab have also suggested that these plastic particles could have a negative impact on the heart and circulatory system.

But until now scientists did not know how they actually affected blood vessels.

So, when new research on the topic emerged, many media outlets were quick to run stories on its finding that these tiny plastic particles may increase the risk of having a heart attack or stroke.

The study, published in the New England Journal of Medicine <https://www.nejm.org/doi/10.1056/NEJMoa2309822?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%200pubmed> , followed a group of people who'd had a procedure to remove fatty material that had built up in the main blood vessels (atherosclerosis) in their necks called a carotid endarterectomy.

After the procedure, the researchers examined the fatty material, called plaques, that had been removed from the neck blood vessels of 257 people.

They discovered more than half (58 per cent) of them had tiny plastic particles in their plaques.

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Using a special high-powered microscope, the researchers could see the jagged edges of the particles known as microplastics and nanoplastics (the smallest particles).

They found two types of plastic – polyethylene and polyvinyl chloride – out of 11 they looked for.

These could have entered the body from eating or drinking contaminated products, breathing the particles in, or by absorbing them through the skin, the researchers said.

They also discovered that participants with plastic in their plaques had high levels of some types of inflammatory markers in their plaques too.

These markers are known to play a role in the build-up of these fatty plaques in the blood vessels, which raises the risk of a blood clot developing that can cause a heart attack or stroke.

The more plastic a person had the higher their blood levels of inflammatory markers, reported the research team who followed the study's participants for almost three years after they'd had the plaques removed.

During those three years, they found those who had plastic in the plaques in their blood vessels were 4.5 times more likely to have a heart attack, stroke, or die, than those whose plaques were plastic free.

However, the participants with plastics in their plaques were more likely to smoke, have high cholesterol, diabetes, and heart and circulatory disease – all known risk factors for heart attack and stroke – than those who did not have plastic in their plaques.

The researchers stressed their findings did not prove that tiny plastic particles in the environment cause a heart attack or stroke.

But that it showed there was a link between the two.

What do the researchers say?

The researchers looked at the number of heart attacks and strokes happening in people with few known risk factors.

They say their findings do not prove that microplastics and nanoplastics cause hearts attacks and strokes but suggest they may be a previously unknown risk factor.

Previous studies carried out in mice and human cells in the laboratory have also suggested these plastics could negatively impact the heart and circulatory system.

An analysis in the journal of Environment International <https://www.sciencedirect.com/science/article/pii/S016041202200589X?via%3Dihub> of this earlier research shows that certain microplastics and nanoplastics can harm the cells of the heart and blood vessels causing abnormal heart rate, damage to the heart muscle, and preventing the heart working properly.

This new study adds to this knowledge by showing for the first time that microplastics and nanoplastics are present in the fatty plaques of some people with atherosclerosis.

Interestingly, the particles the researchers found were mainly nanoplastics, the tiniest of particles.

The researchers say this supports the idea that nanoplastics are potentially the most dangerous to human health because they can spread more easily around the body than larger particles.

However, they are unable to say why just two plastics – polyethylene and polyvinyl chloride – were detected in the study's participants.

More research is needed, they say, to find out whether these two plastics are better able to lodge in fatty plaques in blood vessels, and if this means they're more harmful to the heart than other plastics.

The BHF verdict

Professor Bryan Williams, British Heart Foundation's Chief Scientific and Medical Officer, says the study's findings are "concerning".

Finding tiny plastic particles lodged in the fatty plaques of human arteries is important, he says, as it suggests plastic pollution in the environment may be harming our hearts.

"This is the first study to show microplastics and nanoplastic particles are present in the fatty plaques in human arteries, and that they may pose a potential risk to our heart health.

"This is worrying and should be considered when talking about the impact environment can have on our health."

Avoiding all invisible plastics in the environment may not be possible.

But there are many things you can do to reduce your risk of heart attack and stroke.

These include:

- keeping active
- maintaining a healthy weight and diet
- limiting how much alcohol you drink (less than the recommended 14 units per week)
- stopping smoking and using other tobacco products
- controlling high blood pressure, cholesterol levels and blood sugar levels (if you have diabetes).

How good was the research?

The research is an observational study of 257 people whose blood vessels had been narrowed by 70 per cent or more due to fatty plagues, but had no symptoms, and were having a procedure to remove the fatty plaques.

The study size is small. However, the researchers looked at this before starting the study to make sure their findings would be statistically significant.

To make sure they had accurate information on the presence, or not, of the tiny plastic particles, the researchers used three different tests to analyse the removed plaque material.

They looked for 11 different plastics and found polyethylene in 150 participants and polyvinyl chloride in 31.

They also tested participants' plaques for four proteins that can show signs of inflammation in the body.

They did this on the back of a review of 46 studies by researchers in China and Denmark <https://portal.findresearcher.sdu.dk/en/publications/micro-and-nanoplastics-a-new-cardiovascular-risk-factor> that suggested microplastics and nanoplastics led to inflammation, which is known to increase the risk of heart attack and stroke.

They found high levels of inflammation proteins in participants whose plaques contained plastic, with the amount of proteins rising with the amount of polyethylene detected.

To find out which participants had a heart attack, stroke, or died over the 34 month-long follow up period, the researchers monitored their electronic records.

To prevent any bias, the people carrying out the monitoring did not know who had plastic in their plaques and who did not.

The researchers also assessed each participant's baseline risk of heart attack, stroke and death by looking at other risk factors such as age, sex, body mass index, diabetes, high cholesterol, high blood pressure, and having had a previous heart event.

This meant any link between having the tiny plastic particles in plaques and having a heart attack, stroke, or dying, could be clearly identified.

However, like all research, the study has limitations.

Importantly, as it only included people with high levels of narrowing of their neck arteries and no symptoms, the findings cannot be generalised to other people.

Also, despite accounting for many risk factors for heart attack and stroke, the researchers failed to look at some social risk factors, such as a person's income and education.

The researchers also admit they cannot rule out the possibility that the fatty plaques were contaminated with plastic particles in the laboratory after being removed.

To make sure this is accounted for in future studies, they advise using clean rooms where there is no plastic material.

How good was the media coverage?

The research was covered by many UK media outlets including the Daily Mail <https://www.dailymail.co.uk/sciencetech/article-13168157/Microplastics-risk-heart-attack.html> , The Guardian <https://www.theguardian.com/environment/2024/mar/06/microscopic-plastics-could-raise-risk-of-stroke-and-heart-attack-study-says> , Sky News <https://news.sky.com/story/microplastics-in-blood-linked-with-stroke-heart-attack-and-early-death-study-finds-13089159> and The Independent <https://www.independent.co.uk/climate-change/news/microplastics-body-heart-study-nanoplastics-b2508566.html> .

Overall, they were accurate in reporting the study's findings and stating that they did not prove microplastics and nanoplastics caused heart attacks and stroke, only that there was a link between the two.

However, Sky News' headline "Microplastics in blood linked with stroke, heart attack and early death, study finds" was misleading as the plastic particles were not found in the blood, but in the fatty plaques on the walls of blood vessels in the neck.

The Independent took the most balanced approach to its reporting, detailing the study's limitations and concluding it raised more questions than it answered.

The outlet quoted Dr Steve Nissen, a heart expert at the Cleveland Clinic in the US, who said: "The study is intriguing. However, there are really substantial limitations.

"It's a wake-up call that perhaps we need to take the problem of microplastics more seriously. As a cause for heart disease? Not proven. As a potential cause? Yes, maybe."

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READ THE ARTICLE <HTTPS://WWW.BHF.ORG.UK/INFORMATIONSUPPORT/HEART-MATTERS-MAGAZINE/NEWS/BEHIND-THE-HEADLINES/ULTRA-PROCESSED-FOODS>

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