Plastic nanoparticles make larval zebrafish hyperactive

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Nanoplastics influence the behaviour of larval zebrafish, says new research by the Institute of Biology Leiden (IBL) and the Institute of Environmental Sciences (CML). The researchers observed that a certain type of nanoparticles leads to stress reactions in the sugar balance, resulting in hyperactivity in the fish larvae. The study was published on 18 October in *Nature Communications Biology*.

A chain of reactions

The researchers looked closely at what happened to plastic nanoparticles

in larval zebrafish. Nanoparticles are a class smaller than microparticles and it has been known that they behave differently, but how exactly is still unclear in many cases. The team discovered that the nanoparticles, after uptake, cause a whole chain of reactions.

They saw that the plastic accumulation first causes a decrease in the glucose level of the larvae. This is followed by a hunger signal to the brain, after which the cortisol level rises. At the same time, extra glucose is produced, causing the blood sugar level to rise.

All these changes ultimately result in a change in behaviour. It turned out that the larvae are up to 50 percent more active in a standard behaviour test compared to larvae without nanoplastics. "The nanoplastics affect all kinds of different biological functions, not just behaviour. Nanoplastics can therefore have an effect on every level in the body," says co-author Christian Tudorache.

Unique research

Because the zebrafish belongs to the vertebrates—just like humans—the zebrafish is an effective model. Previous studies have already investigated the influence of nanoplastics on vertebrates, but this research is the first study that shows what the different steps in the body are. A recent publication by Leiden researchers Fazel Monikh and Martina Vijver can even provide a more accurate picture. They developed a new technique to measure accumulations of plastic particles in tissues. This allows the researchers to determine whether the nanoparticles accumulate in one place in the zebrafish larvae, or whether they spread further.

What about humans?

This study shows the effects on zebrafish larvae, but should people start to worry? "There's not much we can say about that yet. But it can be substantiated that a similar effect also occurs in humans, because we know that plastic nanoparticles are present in every tissue of our body," says Tudorache.

More information: Nadja R. Brun et al. Polystyrene nanoplastics disrupt glucose metabolism and cortisol levels with a possible link to behavioural changes in larval zebrafish, *Communications Biology* (2019). DOI: 10.1038/s42003-019-0629-6

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