Do Our Tonsils Absorb Nanoplastics?

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In a recent perspective article published in the Frontiers in Nanotechnology journal, researchers examined if the tonsils absorb nanoplastics.

Background

Nano and microplastics are ingested and inhaled by humans through different routes, with air inhalation and ingestion likely being the main routes. While microplastics are plastic particles below 5mm, nanoplastics are those broken down into 1 to 100nm, i.e., sizes exceptionally small. In addition, their impacts on the human body and immune system are unknown.

Existing reports have considered food and air exposure scenarios of nanoplastics involving lungs, blood, and intestine. The fact that plastic particles also pass through the throat, nose, and oral cavity has been disregarded so far.

The tonsils are an immunologically crucial tissue in the oral cavity where inhaled and ingested substances are incorporated via crypts with the ability to capture substances and trigger early immunologic responses. However, there is little research on the micro and nanoparticles incorporation in the tonsils.

About the study

In the current work, the researchers introduced the tonsils as a possibly highly intriguing tissue to study the presence of nano and microplastic particles in the human body. They also discussed the lessons discovered when creating a technique for reisolating and identifying nanoplastics from tonsil tissue, which may be beneficial for future method advancements

involving the identification of nanoplastics in tonsils and other tissues in general.

In preliminary analyses, the researchers used density-based separation and concentration to optimize the breakdown of tonsil tissues and attempted to recover added polystyrene nanoparticles. They monitored the polystyrene using Fourier-transformed infrared spectroscopy (FTIR). The experimental design was based on well-known methodologies for extracting microplastics from organisms. However, the authors adapted them to separate and characterize the size of nanoplastics.

Results and discussions

The authors of the present report argued that the tonsil was a very relevant tissue to evaluate the nano and microplastic human exposure and immune reaction. Compared to larger particles and bulk materials, nanoscale particles are known to pass through natural barriers and affect biology in distinct ways. Therefore, the team noted that it was crucial to establish experimental techniques for locating and identifying nanoplastics in the tonsils, even if it is challenging.

The researchers aimed to discover polylactic acid nanoparticles to refine their technology further. Furthermore, they planned to employ breakdown nanoplastics originating from polyethylene terephthalate (PET), polyethylene (PE), and polylactide (PLA). These will be produced by the size-fractionated mechanical breakdown of typical polymers utilized in the daily life of humans, as reported in two prior investigations by Ekvall and the team. This approach will allow the exploration of the potential existence of nano and microplastics and their consequences on the lymph system, tonsils, and immune reactions.

The authors stated that their proposed method was a first step in determining whether nanoplastic particles are taken up by the tonsils, whether they are transported throughout the body, and whether there are any potential immune and other reactions. Future environmental medicine should pay close attention to this problem since it could have significant consequences on human health that are now unknown.

The investigators contend that linking isolated particles with a proven size in the nanoscale range with a chemical characterization was required to assert the existence of nanoplastics in organic samples. Nevertheless, the study results indicate that this could not be feasible because of polymer modification.

The scientists stated that accepting a less straightforward solution might be necessary for the time being. One possible technique was the filtration of breakdown tissue using filters possessing a cut-off at 1 µm or below, extracting the plastics utilizing solvents, and detecting the dissolved polymers. This method has been investigated for identifying plastics' presence, for instance, in the placenta.

Conclusions

On the whole, in the present study, the scientists introduced the hypothesis that tonsils were a potential entry point for nanoplastics into the human body. They suggested that future investigations should concentrate on probable immune impacts caused by nanoplastics.

The team noted that polystyrene could be identified using FTIR in the tissue breakdown solution in micro- and nano-size but not following density-based separation. In addition, they mentioned that the extensive chemical changes of the polymers during the conventional tissue breakdown technique might make the separation and identification of small nano and microplastics even more challenging than anticipated.

The study data depicted that small plastic pieces could be found in the lymph system and tonsil tissue when humans ingest nanoplastics. Notably, the researchers stated that additional studies might probably shed light on the immune and general impacts of nanoplastics on people.

Read the original article on News Medical.