In Human Penile Tissue Research Finds Microplastics

The accumulation of microplastics in the ecosystem is rapidly becoming an environmental and public health concern. In a recent study published, a team of researchers assessed the accumulation of microplastics in penile tissue to determine potential toxicity concerns.

Introduction

Microplastics with diameters less than 5 mm have spread across terrestrial and aquatic ecosystems and the atmosphere, becoming a serious environmental concern. Detecting microplastics in the gastrointestinal tracts of various animals, especially marine animals, has further highlighted the danger microplastics pose to the environment.

Recent studies have also reported the accumulation of microplastics in human organs and tissues, such as cardiac tissue, lungs, placenta, and stool samples, indicating that microplastic pollution is rapidly becoming a significant health concern.

Microplastics' small size allows them to interact with the body and trigger immune responses. The potential introduction of chemical pollutants and pathogens into the body through microplastics also raises health concerns.

Study

In the present study, the researchers used laser direct infrared microspectroscopy to detect microplastic aggregation in penile tissue obtained from patients with erectile dysfunction undergoing a procedure to insert an inflatable penile prosthesis.

While ingestion and inhalation of microplastics can lead to accumulation in organs such as the liver, intestines, kidneys, and lungs, and potentially in the circulatory system, dermal contact is of concern only with regards to microplastics less than 100 nm in size, which can traverse the skin. Very small microplastics can infiltrate cells and interfere with cellular function.

Recent studies have shown that microplastic accumulation in the body can impact sperm quality, fertility, and reproductive success. They can also cause abnormalities in sperm morphology and reduce sperm count.

The present study included six patients with erectile dysfunction who underwent a surgical procedure for multi-component inflatable penile prosthesis insertion. Samples of the corpora were obtained during the surgery.

A stringent protocol involving only glass and metal labware was followed to ensure no contamination of the tissue samples with microplastics from external sources. A control sample was also included, where the tissue was stored in a McKesson plastic specimen container.

The identification of the microplastic polymers using laser direct infrared microspectroscopy was initially validated using a range of microplastic reference materials such as acrylonitrile butadiene styrene, artificially aged polyamide, cellulose acetate powder, cryomilled polystyrene, polyethylene terephthalate, polyethylene, polyethylene, polypropylene, and polyvinyl chloride from various sources.

Microplastics were extracted from the tissue samples using a combination of sodium hypochlorite and potassium hydroxide and filtered using gold-coated polyethylene terephthalate glycol membrane filters.

The particles were analyzed for polymer type, size, and size number distribution using a laser direct infrared chemical imaging system.

The infrared spectra of all the synthetic polymer types that were assigned were checked to account for any interference from fatty acid remnants. Additionally, scanning electron microscopy was used to investigate the filters used in the laser direct infrared spectroscopy and observe the morphology of the particles.

Findings

The study found that laser direct infrared spectroscopy could identify microplastics between the size range of 20 µm to 500 µm in over 80% of the samples, while scanning electron microscopy detected samples as small as 2 µm in diameter in the corpora samples.

The penile tissue samples had seven different types of microplastics, with polyethylene terephthalate and polypropylene constituting 47.8% and 34.7% of the microplastics, respectively.

These two types of microplastics are the commonly used non-biodegradable polymers in packaging and everyday goods such as beverage and food packaging and reusable plastic bottles and containers.

Previous studies have examined and reported the impact of microplastics on sperm quality and number and male infertility. Murine model studies have also shown that mice that ingested microplastics through drinking water showed reduced live sperm count compared to controls.

Studies have also indicated that microplastics can cause morphological abnormalities in the sperm, along with an increase in inflammatory markers such as nuclear factor κB and interleukins B and 6. The findings from this study also suggested that microplastic aggregation in penile tissue could be linked to erectile dysfunction, which warrants further research.

Conclusion

Overall, the findings reported that over 80% of the penile tissue samples had microplastics ranging from 20 µm to 500 µm, and some as small as 2 µm. Polyethylene terephthalate and polypropylene were the two most common microplastic polymers in the penile tissue samples.

Given the existing evidence on the association between microplastic aggregation and decreased sperm quality and number and the findings from the present study, the researchers believe that the possible association between microplastic accumulation in the penile tissue and erectile dysfunction needs to be explored further.

Source:

https://www.news-medical.net/news/20240621/Research-finds-microplastics-in-human-penile-tissue.aspx