

Microplastic burden in the human brain linked to stroke and dementia: apheresis emerging as the first plausible removal

Brain Health Perspective by scientists in the USA, Germany, and Canada converges measurement, mechanism and intervention as the field moves from alarm to action

NEW YORK, NY, UNITED STATES, May 5, 2026 /EINPresswire.com/ -- In a Perspective published today in the inaugural issue of [Brain Health](https://doi.org/10.61373/bh026p.0006) (<https://doi.org/10.61373/bh026p.0006>), an international team of investigators from the USA, Germany, and Canada argues that the human microplastic burden has crossed the threshold from environmental concern to brain health emergency. The article appears alongside the launch of Brain Health, a new peer-reviewed journal from [Genomic Press](#) dedicated to the science of lifelong brain resilience.



The human microplastic burden, visualized. Decedent brain tissue now carries seven to thirty times the concentration found in liver or kidney.

The Perspective synthesizes evidence across three domains that until recently sat in separate scientific silos. Decedent human brain tissue, sampled from a 2016 to 2024 cohort and analyzed by Nihart and colleagues at the University of New Mexico, carries microplastic concentrations seven to thirty times higher than matched samples of liver or kidney. The cumulative tissue burden rose by approximately fifty percent across that eight-year window. Donors with diagnosed dementia carried the heaviest loads. Polyethylene predominated, presenting largely as nanoscale, shard-like fragments.

The cardiovascular evidence is now equally striking. Marfella and colleagues, working with patients undergoing carotid endarterectomy, identified microplastics and nanoplastics inside atheromatous plaque. Patients whose plaque tested positive for these particles experienced a

roughly fourfold increase in the composite risk of myocardial infarction, stroke, or death over thirty-four weeks of follow-up. As the new Perspective notes, this is a brain finding as much as a cardiac one, because stroke is a brain outcome.

How do these particles reach the brain in the first place? Animal data are now closing that gap. Polystyrene nanoparticles administered orally to mice were shown by Kopatz and colleagues to cross the blood-brain barrier within two hours of exposure, with the biomolecular corona acquired in transit functioning as the passport for entry. Larger particles do not cross. Nanoscale particles do.



The human microplastic burden and brain health. Schematic overview of selected sources, exposure routes, mechanisms, and health impacts associated with microplastic and nanoplastic accumulation in the human body.

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Julio Licinio, MD, PhD, MBA, MS

“Cognition, mood, stroke, dementia. Treating this as a peripheral environmental concern, when the relevant peripheral organs carry less of the contaminant than the central one, has become difficult to defend.”

The Perspective also foregrounds a delivery vehicle that operates at population scale: ultra-processed food. Group 4 of the NOVA classification, ultra-processed foods now supply more than half of caloric intake in the United States. They are also high-throughput vectors for microplastic

exposure, through packaging migration during heating and storage, mechanical wear during industrial processing, and downstream contamination. Independent of microplastic content, ultra-processed food consumption has been linked in large prospective cohorts to depression, anxiety, cognitive decline, stroke, and dementia. A meta-analysis of 385,541 participants found a fifty-three percent increase in the odds of common mental disorder symptoms in those with the highest ultra-processed food intake. UK Biobank data link the same dietary pattern to increased dementia risk. The REGARDS cohort showed that a ten percent rise in relative ultra-processed food intake was associated with a sixteen percent increase in cognitive impairment risk and an eight percent increase in stroke risk, holding independently of adherence to Mediterranean,

DASH, or MIND dietary patterns.

“The boundary between physical and mental health has always been more administrative than biological,” notes Dr. Nicholas Fabiano of the University of Ottawa Department of Psychiatry, a co-author on the Perspective.

“Microplastics do not respect that boundary. The same particles that lodge in atheroma also reach the brain. The same dietary exposures that raise cardiovascular risk also raise risk for depression and dementia. We are looking at one problem with many clinical faces.”

The Perspective treats removal as the next frontier rather than a distant aspiration. Bornstein and colleagues, working at the University Hospital Carl Gustav Carus in Dresden, recently reported that therapeutic apheresis can extract material consistent with microplastic particles from human plasma. The mechanism is biologically plausible. The clinical infrastructure already exists in tertiary centers worldwide. On present evidence, apheresis is the most promising candidate intervention the field has produced.

“We were initially surprised by what we observed,” says Dr. Stefan R. Bornstein of Technische Universität Dresden and King’s College London, senior co-author. “Apheresis is an established clinical modality. The fact that it appears to engage these particles in vivo opens a path that did not exist a year ago. The work now is to validate the signal against measurement standards the broader scientific community can agree on, and to develop scalable alternatives matched to polymer specificity, tissue compartment, and patient population.”

“What the field still lacks is the measurement infrastructure that would let us rank polymers by harm and confirm that interventions are working,” adds Dr. Charlotte Steenblock, also of Technische Universität Dresden and a co-author. “Without validated, reproducible, polymer-specific quantification, no removal strategy can be confirmed in the strict sense. That is not a weakness of the apheresis approach. It is a feature of a field operating ahead of its own analytical tools.”

The authors note that the science of brain health, at the level of national funding priority, is now moving toward subtraction with the same seriousness it has long given to addition. In April 2026, ARPA-H, the agency built on the model that produced GPS, the early Internet, and the foundational work behind mRNA vaccines, launched STOMP: Systematic Targeting Of MicroPlastics. The program is organized around the same three priorities the new Perspective

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PERSPECTIVE

The human microplastic burden and brain health: From measurement to pathophysiology and removal

Julio Licinio¹, Charlotte Steenblock², Nicholas Fabiano³, Stefan R. Bornstein^{2,4,5}, and Ma-Li Wong¹

Microplastics and nanoplastics now contaminate every human compartment examined, including blood, placenta, atheromatous plaque, and brain tissue. The brain warrants particular attention. Decedent brain tissue has been shown to carry microplastic concentrations seven to thirty times higher than liver or kidney, with a 50% rise documented between 2016 and 2024, and the highest burdens observed in donors with diagnosed dementia. Animal data confirm that nanoscale particles cross the blood-brain barrier within hours of oral exposure. Ultra-processed foods, which now account for more than half of caloric intake in the United States, serve as high-throughput delivery vehicles for microplastics via packaging migration, mechanical processing, and contamination. They have themselves been independently linked in large prospective cohorts to depression, anxiety, cognitive decline, stroke, and dementia. The convergence of high tissue burden, biologically plausible mechanism, and a population-scale modifiable exposure vehicle defines a Brain Health emergency. We outline what is known, what is not yet measurable, and where the field must move next, with attention to vulnerable populations including pregnant women, children, and patients with established neurological or cardiovascular disease.

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identifies: develop measurements that can characterize nanoscale particles in complex biological tissue, illuminate the mechanisms by which microplastics traffic through organs and cause harm, and translate that knowledge into clinical removal.

Vulnerable populations sit at the center of the policy question. Microplastics have been localized within the intracellular compartment of human placenta, implying fetal exposure during the most consequential window of neurodevelopment. Children, with developing blood-brain barriers and higher per-kilogram intake than adults, carry a lifetime burden trajectory that today's adult cohorts cannot predict. Patients with established cerebrovascular disease, in whom the Marfella signal becomes most clinically relevant, are already in clinics today. So are patients with neurodegenerative disease, in whom the Nihart finding of disproportionately high brain burden raises a question that will not go away: are these particles passenger, accelerator, or contributor?

In the absence of a validated clinical removal modality, the Perspective notes, population-scale exposure reduction is currently achievable only by reducing ultra-processed food consumption. That is not a trivial intervention. It is, however, the one lever the field has at present that operates at the scale of the problem.

The peer-reviewed Perspective, "The human microplastic burden and brain health: from measurement to pathophysiology and removal," appears online on 5 May 2026 in Brain Health, in the journal's inaugural issue, and is freely accessible at <https://url.genomicpress.com/2p8axkk3>

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Ma-Li Wong

Genomic Press

mali.wong@genomicpress.com

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