

Plastic... not always fantastic

Polyether has been part of dentistry since the 1970s. We use it daily; it's safe, and rigid enough for accurate impressions.

Several other forms of polyether have been introduced recently. One is called 'PEEK' (polyether ether ketone), a tooth-coloured, single monomer that has a low Young's modulus of elasticity (Wiesli et al, 2015) and is a rigid semicrystalline polymer (Zheng et al, 2015). It is used in three-dimensional technology as a replacement for metal, such as in large frameworks for partial dentures (Whitty, 2014) and bridges, implant reconstructions and in general medicine to produce artificial joints.

Being tooth-coloured, biocompatible, and strong, this new material offers several advantages and benefits for aesthetic dentistry. But there is another form of polyether used in dentistry that comes with an environmental impact.

Polyethelene – not polyether

Polyethylene glycol (PEG) is a polyether compound with applications from industrial manufacturing to medicine. It is a common type of plastic, often found in the form of polyether beads (or microbeads). These are often labelled simply as PE (polyethylene), PP (polypropylene) or PMMA (polymethyl methacrylate) under the ingredients list (ADA 2014).

These microbeads are minute plastic spheres, less than half a millimetre in diameter, which are used in consumer products from toothpaste face creams and cosmetic scrubs to lip balm, deodorants and chewing gum. They are found in hundreds of consumer products, and just a single tube of face wash can contain up to 30,000 microbeads. After use, they are discharged into waste water systems and flushed out into the sea.

The view from the chair

A US hygienist, Trish Walraven, has brought some dental perspective to this topic. While performing prophylaxis on a patient, she noticed a blue bead disappear into a gum pocket. On investigating, the patient reported that they were using toothpaste containing microbeads.



There were 'bits of blue plastic in my patients' mouths every single day,' she wrote on the website Dentalbuzz.com (2014). This plastic came from toothpaste, she argued and it was getting stuck in patients' mouths. Now, dentists are concerned that the microbeads trap bacteria, possibly causing gingivitis.

Further research reveals the damage these microbeads are doing to the environment. They do not decompose once in the ocean; instead they are eaten by fish and enter the food chain.

A recent article in *The Times* (2015) highlighted the issues these microbeads cause.

Although there are very few UK toothpastes that contain these microbeads, Britain – along with the rest of the EU – is being urged to follow the lead of New York State, which last year became the first place in the world to prohibit them in cosmetic products after the vast majority of personal care companies failed to agree to an immediate voluntary ban.

The House of Commons Science and Technology Committee last year heard evidence of the serious impact that microplastic waste could be having on Britain's aquatic environments. Some members have called for tougher legislation if the cosmetics industry continues to prevaricate.

'There is no reason for these microplastics in cosmetic products. If they are not taken out voluntarily, then there should be legislation to ban their use,' said Graham Stringer MP, a member of the Commons committee.

Microbeads and the environment

In 2012, Unilever announced it would phase out the use of microbeads in all of its products by 2015. The Body Shop, Johnson & Johnson, Beiersdorf, L'Oreal and just recently Proctor & Gamble have also agreed to starting phasing plastic microbeads out but no end dates have been set.

While we should all celebrate the new advances in PEEK materials that have been highly researched and offer new uses, particularly in aesthetic dentistry, we need to be aware of the different forms of polyether – polyethene microbeads that need to be phased out of dental and cosmetic products.

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