Restorative materials and environmental pollution
This evidence summary is based on a manuscript accepted for publication in the BDJ. It summarises studies that examine the effects on the environment of composite restorative materials used in dentistry. It does not include information not presented in the literature.

The Curious about website encourages dental professionals to raise issues where a review of the available evidence would provide a useful resource for other dental professionals. Where there is a lack of evidence, the topic is considered for research and an award is made available.

These activities are sponsored by the Shirley Glasstone Hughes Fund, a restricted fund within the BDA Trust Fund. The focus of the fund is research into primary care dentistry and aims to generate a body of relevant research for practising dentists.
Key findings

- No evidence was located addressing the role of dental plastics in environmental pollution.
- With the increasing demand for composite and resin-based restorative materials this area could be considered for future research.

Research question

This evidence summary was prepared in response to the following question: Can dental restorative materials containing plastics act as an environmental pollutant?

Background research together with the wide employment of bisphenol A (BPA) derivatives led to the selection of BPA and its derivative products as the focus, though dental composites could contain other environmental pollutants.

Key terms

**Pollutant**
A substance that pollutes something, especially water or the atmosphere.\(^{(9)}\)

**Resin composite**
A reinforced polymer system used for restoring hard tissues for example enamel and dentine.\(^{(2)}\)

**Plastics**
Polymeric materials (usually organic) of large molecular weight that can be shaped through plastic flow. Plastic usually refers to the final product with fillers, plasticisers, pigments, and stabilisers included (versus the resin, the homogeneous polymeric starting material).\(^{(9)}\)

The case for action

Plastics are vital to modern dentistry. Not only are they found in fixtures, fittings and packaging, they are components of composite resin-based materials and sealants. With the increasing demand for aesthetic restorations, and the controversial nature of amalgam, the use of composite resin-based materials is on the increase.\(^{(4,5)}\)

Composite materials are complex and can contain a number of plastic components including BPA derivatives such as bisphenol A glycidyl methacrylate (Bis-GMA) and bisphenol A dimethacrylate (Bis-DMA).\(^{(6)}\) Although BPA is not used directly in dental materials,\(^{(7)}\) the compound could be present as an impurity\(^{(8,9)}\) and released during placement\(^{(10-12)}\) due to incomplete polymerisation, or through leaching.\(^{(13)}\) However, under the physiological conditions of the oral cavity BPA is not released from all its derivative compounds.\(^{(14,15)}\)

BPA, one of the most widely used chemicals in the world,\(^{(16)}\) has received increasing attention over the last few years as an endocrine disruptor – an agent capable of disrupting the functions of the endocrine system. When consumed orally, BPA is well absorbed and metabolised in the liver but for a variety of reasons there is disagreement about the possibility of human health effects that may result from exposure.\(^{(17)}\)

BPA is found ubiquitously in the environment mainly as a result of industrial manufacturing and processing.\(^{(18)}\) Alternative release routes include leaching from landfill\(^{(19-21)}\) and waste burning\(^{(22,23)}\) indicating that dental composites could be a source of environmental BPA. The chemical is degraded or metabolised in the environment\(^{(24)}\) but there is no conclusive information as to the effect of BPA. As a consequence, risk assessments have reached polarised conclusions varying from the risks being below the levels of concern\(^{(20)}\) to a possible immediate or long-term harmful effect.\(^{(21)}\)

The evidence

No studies were found that investigated the contribution of dental composite materials to environmental pollution. While dental materials are often recognised as a source of acute BPA exposure to the individual patient,\(^{(21,25,26)}\) BPA of dental origin and its effects on the environment do not appear to have been assessed.

Methods

**Search strategy**
The following databases were searched:

- Ovid MEDLINE
- GreenFILE
- Toxline
- CAB Abstracts
- Science Direct
- Polymer Library
- Aqualine
- Environmental Sciences and Pollution Management

Search terms for Ovid MEDLINE included Bisphenol A-Glycidyl Methacrylate, Composite Resins, Compomers, Resins, Synthetic and Environmental Pollution. Equivalent terms were used for other databases.

The library of the Collaboration for Environmental Evidence, Open Grey and IADR Abstracts were searched as well as other sources of grey literature. Searches are current as of October 2012.

Selection criteria for inclusion were any study that examined the effect of dental BPA on the environment.

Results

No studies were found.
References