Evidence summary: can plastics used in dentistry act as an environmental pollutant? Can we avoid the use of plastics in dental practice?

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KEY TERMS

- **Environmental audit:** defined by the International Chamber of Commerce as 'a management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organisation, management and equipment are performing with the aim of helping to safeguard the environment.'
- **Hazardous waste:** waste products which can cause health risks to humans or animals through skin contact, inhalation or ingestion.

RESEARCH

Since August 2009, members of the Primary Care Dentistry Research Forum (www.dentistryresearch.org) have taken part in an online vote to identify questions in day-to-day practice that they felt most needed to be answered with conclusive research. The question that receives the most votes each month forms the subject of a critical appraisal of the relevant literature. Each month a new round of voting takes place to decide which further questions will be reviewed. Dental practitioners and dental care professionals are encouraged to take part in the voting and submit their own questions to be included in the vote by joining the website.

The paper below details a summary of the findings of the twelfth critical appraisal. In order to address the question, searches of the literature were conducted to identify any articles discussing or evaluating the use of plastic in dental practice, or interventions that might reduce the use of plastics in dental practice. There were no studies identified that directly answered the question of this review. In a narrative review, environmental audit was suggested as a strategy that could help dental practitioners make more informed decisions in their practice; but there were not any studies that evaluated this. Further studies are need to demonstrate what proportion of dental waste includes plastics and whether specific interventions such as environmental audit can decrease the amount of plastic use and waste along with improving other environmental outcomes.

BACKGROUND

The necessity to protect the environment is well recognised. As part of our commitment to the environment, several bodies provide guidance for health professionals including dentists on best practice to protect the environment. Health professionals are also provided with specific guidance on how to deal with infection control in their practice. Therefore, in issues such as waste management, dentists (and other health professionals) need to consider strategies that take into account both regulations and guidance.

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The British Dental Association provides an advisory note on healthcare waste management as part of the legislative responsibility that dentists need to ensure that all healthcare waste is managed and disposed of properly.[1] The guidance requires that dentists should identify each waste product as hazardous (including clinical waste), non-hazardous or offensive and document how each of them are handled in the practice. There is no specific section on how to manage plastics. A number of materials made of plastic in a dental practice might come into contact with wounds and body fluids and would therefore subsequently need to be managed as clinical waste (hazardous waste).

There is currently no overall guidance for dentists on how they can minimise plastic use and plastic waste in their practice. Moreover, it is unclear how much dentists contribute to environmental pollution through their use of plastic products.

METHODS

The following searches were conducted to identify any articles discussing or evaluating the use of plastics in a dental practice or interventions that might reduce the use of plastics in a dental practice:

1. Medline (OVID) on 2 March 2011 (search strategy shown in Table 1)
2. Environmental Management database on 7 April 2011 with the search term 'dental'. The Environmental Management database, published by IHS, provides access to documents from over 100 issuing bodies. More information can be found at http://www.ihs.com/en/uk/products/industry-standards/regulations/environmental-management.aspx

3. CAB database (EBSCO) on 8 April 2011 with the search terms (TX plastic AND TX dentistry) or (TX plastic AND TX dental). CAB stands for Commonwealth Agricultural Bureaux, produced by the Centre for Agricultural Bioscience International (CABI). TX stands for text, which in this case means searching all of the text of the article with the defined word
4. Environment Complete (EBSCO) on 8 April 2011 (search strategy shown in Table 1).

Additionally, all draft reviews in the library of the Collaboration for Environmental Evidence (http://www.environmentalevidence.org/Library.html) were screened for potential relevance.

After screening the search results, environmental audit was identified as a potential relevant intervention and therefore a second search was conducted in Medline (PubMed) with the search terms (environment* AND audit* AND (dental OR dentist OR "oral health")) to identify any studies on environmental audits conducted in dental practice.

FINDINGS

The search results were as follows:

- Medline (OVID): 60 results
- Environmental Management database: 38 results
- CAB: 57 results
- Environment Complete (EBSCO): 304 results.

There were no relevant reviews, studies or documents in the Collaboration for Environmental Evidence database, Environmental Management database or Environment Complete. There was one potential study in the CAB search results. However, after a more careful evaluation, it was not found to be directly relevant to the topic of the review as it focused on the knowledge and management strategies of dentists in the disposal of potentially hazardous waste (plastic or non-plastic).[2] From the first Medline search, the full texts of four potentially relevant articles were obtained. Two of them were excluded as they were not directly relevant: one evaluated the effect of environmental factors on certain dental materials[3] and the other focused on indoor air quality.[4]

Table 1 Details of the search strategies

Medline (OVID) <1948 to February Week 3 2011>	
1	exp Plastics/ (108,210)
2	limit 1 to dentistry journals (32,004)
3	exp General Practice, Dental/ (3,898)
4	exp Environmental Pollution/ (284,654)
5	1 and 3 (73)
6	(2 or 5) and 4 (71)
7	limit 6 to english language (58)
8	exp Noise/ (15,684)
9	7 not 8 (57)
10	exp Waste Management/ or exp Dental Waste/ (56,401)
11	(2 or 5) and 10 (30)
12	limit 11 to english language (28)
13	9 or 12 (60)
Environment Complete (EBSCO) 8 April 2011	
S6	S4 AND S5
S5	TX waste
S4	S1 OR S2 OR S3
S3	TX environment AND TX dentistry AND TX plastic
S2	TX environment AND TX dental AND TX plastic
S1	TX environment AND TX dentist AND TX plastic

From the two remaining studies, Wilson *et al.*[5] provided an overview of the environmental policies that dentists should consider in their practices. They had a specific section discussing paper and plastic waste. They highlighted the increasing amount of plastic used in dental and laboratory materials and suggested using reusable instruments as a potential solution to decrease plastic use. However, this is not always possible with regard to compliance with control of infection regulations. The final recommendation of the paper was that dentists should conduct an environmental audit that might help them in identifying ways to improve their strategy to comply with regulations and guidance to protect the environment (including plastic use).[5] An updated overview of the environmental policies and regulations for dentists would be helpful for dental practitioners.

The fourth study was a randomised controlled study comparing two impression materials in a general dental practice and evaluated the relative wastage of the materials when used in the clinical setting.[6] The study compared the wastage of material when recording full arch one-stage, polyvinylsiloxane impressions using four different techniques (putty and automix light viscosity material, putty and automix regular viscosity material, putty and tubed light viscosity material, and putty and tubed regular viscosity material). The authors concluded that the automix technique caused the least waste. This study cannot provide any direct evidence regarding plastic use in a dental practice.[6] However, it raises the question of whether environmental outcomes, like amount of waste (including plastic waste), should be considered more often in future clinical trials in dental practices.

Environmental audit

The results of the first literature search suggested environmental audit as a potential strategy for adoption in dental practise. Therefore, a second search was conducted specifically to identify any studies that evaluated the effect of environmental audit in dental practise. Environmental audit has been defined by the International Chamber of Commerce (http://www.iccwbo.org/) as a 'management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organisation, management and equipment are performing with the aim of helping to safeguard the environment.[5,7]

The second search in Medline retrieved 37 results. There was one potentially relevant study on assessment of dental waste management in a Nigerian tertiary hospital but this did not provide specific data on plastic waste or effectiveness of environmental audit.[8] There were no studies describing the effectiveness of environmental audit in a dental practice.

SUMMARY

The current studies and articles are inadequate to give a clear answer to the

question of this rapid review. Dentists might want to consider conducting an environmental audit in their practice following the principles of the International Chamber of Commerce. This could help them in making more informed decisions in their practice.

There is a need for studies to demonstrate what proportion of dental waste includes plastics and whether specific interventions such as an environmental audit can decrease the amount of plastic use and waste emanating from dental practices. In addition to this, future clinical trials comparing the wastage of materials could better inform decision making.

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