BEING MINDFUL OF THE ENVIRONMENT: WHY DOES IT MATTER TO DENTAL STUDENTS?

By Ifrah Khan

'Dentists use a lot of plastic' a year 5 pupil told me, matter-of-factly, at a dental community engagement project at a local primary school in Plymouth.

Up until that moment, it had never occurred to me that the carbon footprint of the dental profession was an area of concern. It got me thinking, how can we as dental students, the leading dentists of tomorrow, consider being more sustainable practitioners?

Concern among our generation for the future is growing – as we know, the long term prognosis of the world we live in isn't great. Dentistry has an important opportunity to address the sustainability of services and set an example for the rest of the NHS and for the wider profession. For students and dentists alike, COVID-19 has changed much of that. With patient priorities changing, potentially meaning that routine check-ups are out the window for the time being, chances to create ways to reduce, reuse and recycle are slim.

What does the Law say?

The Climate Change Act 2008, has set a target for the UK net carbon account in the year 2050, to be at least 100% lower than the 1990 baseline of greenhouse gas emissions.¹ In 2018, the UK carbon emissions was 44% below the 1990 levels², but targets to meet the next carbon budget do not appear to be on track for the UK.

Is the main issue of dental carbon footprint is commuting?

Between 2013 and 2014, 64.5% of greenhouse gas emissions came from travelling to and from dental care practices. This was the highest percentage of the total carbon emissions in NHS primary Dental Care, in England.⁸

In 2018 PHE wrote the report *Carbon modelling within dentistry, towards a sustainable future*. Comparing the 2013/14 data with now, new academic studies have shown that global carbon dioxide emissions dropped roughly 17% during the forced confinement (not dental specific).

Current management of issues in dentistry

Aside from greenhouse gas emissions,

some other causes for concern include decontamination and waste disposal along with the use of single-use plastics.³

As practices across the UK gradually re-open their doors, clinicians up and down the country are dressed head to toe in full PPE, much of which is single use and much of which is made of plastic.

Guidance across the UK on public health and PPE is country specific but the primary focus is protecting human health and stopping the spread of COVID-19. At this point in time even the most environmentally concerned among you will need to follow the public health guidance specific to your country. This will sadly mean a lot of plastic. At the moment, that is what you must do until the restrictions ease or the guidance changes. It's not a comfortable place to be but while there are so many unknowns about the virus the guidance must be followed.

Two of the most commonly used dental restorative materials include amalgam

and the environment from anthropogenic emissions of mercury compound.⁴ This means limiting or prohibiting the use of amalgam on specific patients (summarised in Table 1)⁵ and adhering to the mandatory guidelines of mercury waste disposal.

Composite disposal and the environment

With the growing use of composites as an alternative to amalgam fillings, it is necessary to consider the possibility of leaching waste products from resin-based composites and monomers into our environment. Chemicals including eluates and micro-particulates are carried out via the dental chair water systems exiting the surgery, commonly after removing resin-based composites or while polishing them once placed. These have had negative effects on some sea life. While BPA and methacrylate, two of the chemicals associated with resin-based composites, have been shown to have an effect on human

development. The challenge remains to identify to what extent these chemicals affect humans and the environment, but it is evident that they are environmental pollutants.⁶

What can dental students do?

Greenhouse gas emissions released as a result of travelling to and from dental clinics could be reduced in a number of ways. For example, opting to walk, cycle, or take shared modes of transport such as buses, trains or car-pooling. Likewise, time management and effective treatment planning will enable

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and resin-based composites. There has already been a call to phase down the use of amalgam as a restorative material in dentistry, not just within the UK but also on an international scale. Under The Minamata Convention, dental professionals are responsible for protecting human health

Table 1 The Regulation of Amalgam (2018)⁵

Amalgam regulations

Prohibited use of amalgam in *deciduous* teeth or *children under 15*

Prohibited use of amalgam in *pregnant or breastfeeding* women, unless it necessitates the need to meet specific health requirements of the patient.

Dental amalgam must only be used as *pre-dosed capsules*

It is compulsory to use *amalgam separators*

Amalgam waste must be disposed of correctly, in line with authorised waste collectors

Adapted from British Dental Association. Dental amalgam. 2020. Online information available at <https://bda.org/amalgam> (accessed February 2020)

patients to attend an appropriate number of appointments, reducing their overall travel and surgery time.⁸

In the current climate, using public transport is a more uncomfortable thought for many. Car sharing has always been suggested as an appropriate means of reducing a carbon footprint - but that now is fraught with

sustainable goals for better practice.⁷

Conserving the natural tooth structure is one of the key approaches to reducing the need for restorations. All dental professionals can limit the use of dental materials by adopting an evidence-based approach to caries removal and cavity preparation.

An international team of researchers at the

University of Plymouth have recently completed a study, which focused on the use of stem cells to aid tooth wound healing. Experiments on laboratory-based models have shown promising results in the development of a novel solution in the science

of tooth repair. Although further studies are required for use on humans, it could potentially be a method for managing dental caries in the future.⁹

Areas of research to consider

- Conservative and regenerative dentistry
- Dental materials and sustainability
- Sustainable practice management.

As ever, it is incumbent that dental students deliver an impactful message on prevention to their patients. It is essential that dental schools across the UK teach students to adopt a holistic approach to dental care, by promoting healthy lifestyle choices in addition to effective oral hygiene.⁷

Summary

Dental students should be mindful of their contribution to the carbon footprint. Although more research is required on the impact of dentistry on the environment, there is evidence that some dental materials have undesirable consequences on humans and the environment. It is essential that dental professionals remain familiar with the legislation surrounding the use of materials not only so that an improved service of care is delivered to patients, but also as a part of a greater responsibility towards global sustainability.

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uncertainty - single car occupancy feels much safer. The toolkit for a greener dental practice written in the heady days of pre-COVID-19 suggested encouraging staff/colleagues that live close to the practice to cycle or walk.

Dental teams can join the BDA Good Practice programme, which encourages dental professionals to work towards achieving

References

1. Legislation.gov.uk. Climate Change Act 2008. Online information available at <http://www.legislation.gov.uk/ukpga/2008/27/section/1> (accessed August 2020).
2. Committee on Climate Change. Reducing carbon emissions. Online information available at <https://www.theccc.org.uk/tackling-climate-change/reducing-carbon-emissions/carbon-budgets-and-targets/> (accessed August 2020).
3. British Dental Association. Sustainability in dentistry. Online information available at <https://bda.org/about-the-bda/campaigns/sustainable/Pages/Sustainability-in-dentistry.aspx> (accessed January 2020).
4. Gov.uk. Minamata Convention. Online information available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731998/TS_9.2018_Minamata_Convention.pdf (accessed August 2020).
5. British Dental Association. Dental amalgam. Online information available at <https://bda.org/amalgam> (accessed August 2020).
6. Mulligan S, Kakonyi G, Moharamzadeh K *et al*. The environmental impact of dental amalgam and resin-based composite materials. *Br Dent J* 2018; **224**: 542–548.
7. British Dental Association. BDA Good Practice. Online information available at <https://bda.org/goodpractice> (accessed February 2020).
8. Duane B, Lee M, White S *et al*. An estimated carbon footprint of NHS primary dental care within England. How can dentistry be more environmentally sustainable?. *Br Dent J* 2017; **223**: 589–593.
9. Science Daily. A new method of tooth repair? Scientists uncover mechanism to inform future treatment. Online information available at <https://www.sciencedaily.com/releases/2019/08/190809085736.htm> (accessed August 2020).

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Further information

There are many resources designed to aid our knowledge of sustainability in dental practice. Here are a few to broaden horizons and your understanding:

- Centre for Sustainable Healthcare – <https://sustainablehealthcare.org.uk/dental-guide>
- BDJ collection on sustainable dentistry: – <https://www.nature.com/collections/djidaaddgi>
- BDA – what they are doing to improve sustainability in practice: – <https://bda.org/news-centre/blog/what-can-we-do-to-make-dentistry-more-sustainable>

<https://doi.org/10.1038/s41406-020-0149-3>