

It's the Environment, Not Just the Tooth

An enjoyable approach to caries and erosion care

By Dr Michael Heffernan, Specialist in Prosthodontics

Declaration of interest: the author is co-founder and a director of Functional Oral Health Ltd, which produces Dr Heff's Remarkables.



The dental environment

Caries and erosion are diseases of the environment around the tooth, not the tooth itself, and Dr Heff's Remarkables are made to change that environment at the moments it matters. The quick case for reaching for them with the right patients:

- They fill the daytime gap. Patients brush morning and night, but teeth take a battering all day. A lozenge in the pocket lets them rebalance after every coffee, snack or acidic drink.
- They work on the environment, not the tooth. They raise plaque pH, push the bacteria back toward health, protect root-dentine collagen and top up the minerals a dry mouth is missing.
- They reach the patients your fluoride advice can't. Dry mouths, patients on multiple medications (polypharmacy), exposed roots, erosion, and everyone who won't touch chewing gum.
- Patients actually use them, because they taste good and freshen breath. No water, no sink, no spare two minutes. The prevention that gets used is the prevention patients enjoy.
- You can recommend them with confidence. They carry an authorised dental health claim and sit happily alongside fluoride and good hygiene, especially for your high-risk patients.

A restoration survives within an environment

A filling, crown or root-surface restoration doesn't cure the disease that made the cavity, it simply has to survive in the same environment that caused it. Leave that environment acidic, low on saliva and dominated by the wrong bacteria, and the restoration is on borrowed time: the restorative cycle just grinds on. Real prevention means fixing the environment, not just the tooth.

Marsh's Ecological Plaque Hypothesis explains why. Fermentable carbohydrate, often enough, lets plaque bacteria produce acid. The mouth sits at a low pH, acid-loving species like *Streptococcus mutans* and *Lactobacilli* take over, and the balance tips from repairing enamel to losing it. On exposed root surfaces the acid also switches on collagen-eating enzymes (MMPs), stripping out the scaffold that any repair depends on.

Tooth erosion, from reflux, fizzy drinks, citrus, and today's acidic "green juices" and smoothies, gets to the same place a different way: too much acid, too often, in a mouth that can't recover between low pH bouts.

It's the Environment, Not Just the Tooth

An enjoyable approach to caries and erosion care

Getting "long in the tooth"

We're all keeping our teeth for longer. In older patients with gingival recession the risk moves to the root, and root caries can be very challenging to restore, with RMGI and composite failing faster and the restorative cycle marching toward extraction. Recession exposes root dentine, softer than enamel and with a vulnerable collagen matrix. Add hyposalivation from polypharmacy, which strips out the mouth's natural buffer and its calcium-phosphate reserve, and a patient becomes high risk of root caries, then the domino run of tooth loss, a denture, poorer hygiene and more decay. These are the patients who benefit most from fixing the environment through the day.

How it changes the environment

Rather than acting on the tooth, Dr Heff's Remarkables is formulated to act on the environment, through three complementary ingredients.

Ingredient	The environmental problem	What it does
Xylitol	Acid-loving bacteria take over the plaque	Bacteria can't ferment it into acid, so plaque turns less acidic and species like <i>S. mutans</i> lose their grip.
Green tea extract (EGCG)	Acid switches on collagenase enzymes that strip the root-dentine scaffold	Helps switch those enzymes off, protecting the collagen scaffold so repair stays possible, and it's antibacterial in lab studies too.
Calcium & phosphate	A dry mouth runs low on the minerals teeth need	Delivers those minerals directly, buffering acid and topping up the reservoir, most useful in dry mouths.

Table 1. The three-ingredient formulation, mapped to the environmental problem each addresses.

The evidence, and how strong it is

In the laboratory, work at the University of Chicago found the Dr Heff's formulation more effective than xylitol alone or artificial saliva at remineralising induced root-caries lesions; the University of Illinois reported an anti-erosive effect under a collagenase challenge comparable to sodium fluoride; and the University of Birmingham showed a reduction in *S. mutans* and *L. casei* from a single lozenge. In humans, intraoral plaque-pH telemetry at the University of Zurich showed rapid neutralisation of acid in thick, three-day-old plaque, faster than sugar-free gum.

It's the Environment, Not Just the Tooth

An enjoyable approach to caries and erosion care

The newest data come from the University of Portsmouth, presented this year by the University at the IADR meeting in Barcelona. Working with human enamel under a natural salivary pellicle (so like real life conditions), the team ran repeated citric acid erosion cycles and measured the surface with laser profilometry. Acid alone left the enamel at roughly 70% of its starting hardness. With Dr Heff's worked into the cycle, hardness came back to about 88%, and there was less surface lost, and what remained was smoother.

The point is simple: even under a pellicle, softened enamel got a real chance to recover, and the tooth wore away less. It is laboratory work, but it points exactly where the rest of the evidence does. Look after the environment and the tooth copes far better.

More broadly, a multi-centre randomised trial of xylitol lozenges in adults reported around 40% fewer root-caries surfaces per year. A Cochrane review took a more cautious view of xylitol overall, though it did not include that adult trial, and its lead author has acknowledged the root-caries evidence would likely rate favourably had it been considered.

In short: a coherent mechanistic and laboratory case, human pH data confirming the immediate effect, and a wider clinical benefit that is well-supported.

Unique because it's enjoyable

The cleverest prevention in the world is useless if the patient never uses it. I sometimes wonder how many of the night guards I make actually get worn! Hence Dr Heff's. A fresh mint lozenge asks nothing of the patient: no water, no sink, no spare two minutes. It lives in a pocket or handbag and gets used exactly when the risk is highest.

For everyone who can't or won't chew gum (denture wearers, patients with jaw problems, or those who'd rather not be seen chewing) it delivers the same acid-neutralising benefit, and in the pH studies did it faster. For a daytime measure, the one that tastes good and freshens breath is the one that actually gets used. Enjoyment is the active ingredient.

Who to recommend it to

Patient	Why the environment is hostile	Why it helps
Older adults with recession	Exposed root dentine; critical pH ~6.2	Neutralises acid at the vulnerable surface through the day
Dry mouth / polypharmacy	Lost buffering and mineral reservoir	Raises pH and supplies calcium & phosphate ions

It's the Environment, Not Just the Tooth

An enjoyable approach to caries and erosion care

Cont. Who to recommend it to

Patient	Why the environment is hostile	Why it helps
Erosion (reflux, acidic diet)	Direct acid dissolution and collagen exposure	Rapid acid neutralisation; collagen protection via EGCG
Orthodontic patients	White-spot risk where cleaning is difficult	Daytime pH control between brushings
Denture wearers	Root caries and candidal overgrowth	Adjunct for surfaces that are hard to keep clean
Fluoride-averse patients	Want a natural adjunct	Natural ingredients alongside their routine

Table 2. Match the patient's environmental risk to the recommendation. Use several through the day at moments of acid challenge, as an addition to (never a replacement for) twice-daily fluoride brushing.

The bottom line

Restorative dentistry treats the damage; it doesn't touch the conditions that caused it. If caries and erosion are diseases of the environment, then prevention has to be environmental too: nudging up the pH, rebalancing the bacteria, protecting the collagen and replacing lost minerals, at the moments that count.

A breath-freshening, dentist-created supplement of xylitol, EGCG and calcium phosphate is a simple way to do exactly that through the day, especially for older and dry-mouthed patients.

References

1. Marsh PD. Microbial ecology of dental plaque and its significance in health and disease. *Adv Dent Res.* 1994;8(2):263-271.
2. Chaussain C, et al. Dentin matrix degradation by host matrix metalloproteinases: inhibition and clinical perspectives towards regeneration. *Front Physiol.* 2013;4:308.
3. Zamperini CA, Bedran-Russo AK. Remineralization potential of mints containing bioactive agents in artificially induced root caries. *Caries Res.* 2018;52(4):331-338.
4. Ritter AV, et al. Tooth-surface-specific effects of xylitol: randomized trial results. *J Dent Res.* 2013;92(6):512-517.
5. Riley P, et al. Xylitol-containing products for preventing dental caries in children and adults. *Cochrane Database Syst Rev.* 2015;(3):CD010743.
6. Asahi Y, et al. Effects of the tea catechin epigallocatechin gallate on *Porphyromonas gingivalis* biofilms. *J Appl Microbiol.* 2014;116(5):1164-1171.
7. University of Portsmouth erosion and remineralisation group. Enamel microhardness and surface loss under a salivary pellicle following bioactive-agent application. Presented at the IADR General Session, Barcelona, 2025. [Full author list and abstract number to be confirmed.] In-vivo plaque-pH telemetry data were generated by Toothfriendly International testing at the University of Zurich; the in-vitro anti-erosion and antimicrobial findings were produced at the Universities of Illinois and Birmingham; the enamel microhardness and surface-loss data are from recent University of Portsmouth research presented at IADR in Barcelona.