

## BioMin F - Smile Revolution Podcast

I recently recorded a podcast with Professor Robert Hill and Richard Whatley on BioMin F toothpaste. An in depth conversation on a very interesting toothpaste. During the preparation for this podcast recording, and after the podcast recording I developed an interest in the area as my understanding evolved. In this article I wish to share my insight into some other considerations I have become aware of, that we could include in building our understanding around toothpastes in general.

Over the past years I haven't really been drawn to analysing toothpastes to the extent I have with BioMin F until the Oral Health Conference in Cardiff last year, when I came to learn about BioMin F which made me want to explore toothpastes further.

As a dental professional, I and respective colleagues have a duty to recommend toothpastes to our patients in alignment with supporting evidence.

I would generally assess the patients overall needs, such as do they experience sensitivity as one example, what is the trigger, are there any other relevant clinical conditions that I may need to take into consideration? On inquiring about what they are currently using, and identifying that their sensitivity is due to dentine exposure. I would follow on by checking if their existing toothpaste aligns with their clinical needs, and has supporting evidences, aligning with the recommendations outlined in 'Delivering Better Oral Health Tool Kit'. I would then share any information regarding any other options they could benefit from, for consideration for them to make an informed decision for change if required.

After running through my own personal assessment process of the questions I have surrounding toothpastes. I decided to reach out to a wider audience through social media, to understand what Dental Hygienists and Dental Therapists currently wish to know about a toothpaste to help build their understanding.

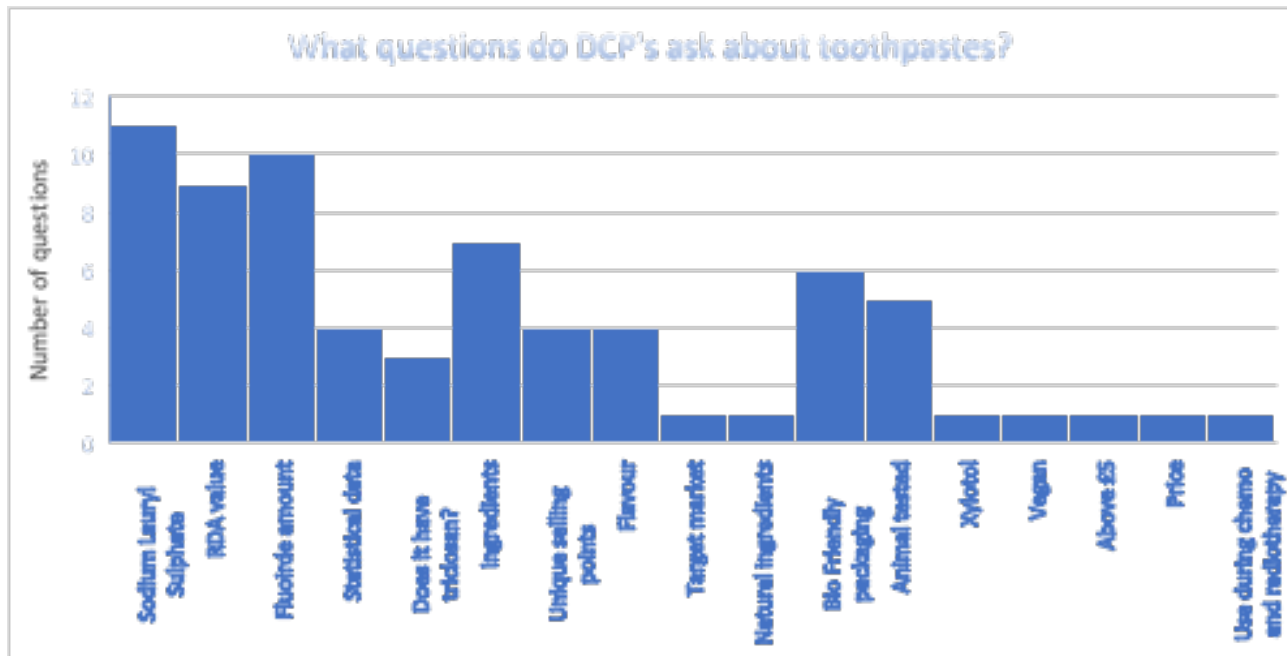
I proceeded to share a question on a social media for dental Hygienists and Dental Therapists to gain a broader insight into what the typical things we as dental professionals look for in a toothpaste.

**'There is a new toothpaste on the market that is not specifically focussed on treating anything in particular. What questions would you ask about the toothpaste?'**

Table 1 shows the responses of 23 Dental Hygienists and Dental Therapists obtained through the post on social media.

**Table 1**

Although this is a small group of respondents, these findings were alone interesting to understand what we as dental care professionals currently consider when we build



our understanding on a toothpaste.

**Most prioritised criteria that DCP's want answered.**

- Does it contain Sodium Lauryl Sulphate?
- What is the Relative Dentin Abrasion (RDA) value?
- What is the amount of Fluoride?

**Why are we focussed on Sodium Lauryl Sulphate?**

Sodium laurel sulphate and fluoride were certainly top of my list due to the consensus that toothpaste containing Sodium Lauryl Sulphate (SLS) could contribute to aphthous ulcers.

Yet what is the evidence on SLS toothpaste causing aphthous ulcers? Looking at a recent systematic review published in 2019 it states that future well-designed trials are still required to strengthen the current body of evidence, in regards to recurrent aphthous stomatitis (RAS), and merely suggests that patients with RAS may benefit from using an SLS free toothpaste. (1) It appears that there is currently insufficient evidence linking the use of SLS toothpaste as a causative factor for RAS.

Since there would appear insufficient evidence linking the use of SLS toothpaste to RAS, could this alter our thinking process in prioritising the need to know if a toothpaste is SLS free or not? If a patient shows signs of RAS it would appear that we do not need to be recommending against the use of SLS free toothpaste linked to RAS. Even if a patient was to show signs of RAS, you could suggest stopping the

SLS toothpaste for time, to monitor if there is any change in the appearance of RAS, yet it may be questionable from the evidence to state that SLS is causative factor.

Essentially SLS is a surfactant, which helps with the foaming/ texture of the toothpaste. Surfactants are essential elements of a toothpaste. Despite some toothpastes being SLS free does not mean they are surfactant free. It is the surfactants by nature that are slightly aggressive to soft tissues, just by swapping from SLS containing toothpaste, to an alternative surfactant does not necessarily overcome the RAS issue. Some surfactants are even more aggressive than SLS.

### **What is the evidence on Fluoride?**

There is sufficient evidence that supports the inclusion of fluoride in toothpaste, relatively high quality trials provide clear evidence that fluoride toothpastes are efficacious in preventing caries. (2)

Increased amount of fluoride in a toothpaste decreases the risk of tooth decay, and due to 'Delivering Better Oral Health' which is evidence based we focus on the recommended amounts of, 1,350 – 1,500 ppm fluoride. (3)

According to professor Ten Cate the world renowned caries expert states that 'For treatments to be effective, longer than the brushing and salivary clearance, Fluoride needs to be deposited and slowly released'. Research has shown that the quantity of fluoride is not the complete answer.

According to Professor Robert Hill on the Smile Revolution Podcast recording and Professor Ten Cate, should we be questioning further the length of time the fluoride remains in the mouth, as well as the amount of fluoride? and the mechanism at which the fluoride is available in the mouth. For years we have recommended fluoride mouth wash in support of fluoride availability, however if it is now possible for the Fluoride to be released slowly over a period of time through a toothpaste, this could be optimal.

In BioMin F according to 'Delivering Better Oral Health' toolkit there is not enough fluoride. However based on Professor Robert Hill's recent podcast recording the Delivering Better Oral Health toolkit was written prior to BioMin F, so this could be a reason the recommended fluoride content for children above 7, young adults and adults, did not take into account the lower fluoride content of BioMin F. The Oral Health Foundation however has accredited BioMin F as an approved oral health care product. 'The Oral Health Foundation' evaluates consumer oral health care products to ensure that the claims made by manufacturers are clinically proven and not exaggerated'.

We will explore this further in the section entitled mechanism of bonding.

### **RDA value. - Relative Dentin Abrasion Value**

It is important to remember that tooth wear is multifactorial. The abrasivity of the toothpaste will play a limited role within the overall process of tooth wear. From various articles it would be fair to say that all toothpastes that have an RDA below 250 are considered safe to use. An RDA of 250 or less produces little wear on dentine and virtually no wear on enamel for the long term accompanied with a correct brushing technique. (6)

Now we have looked at the evidence supporting the above most popular questions I will look into our current understanding on the amount of fluoride in toothpastes in a bit more depth.

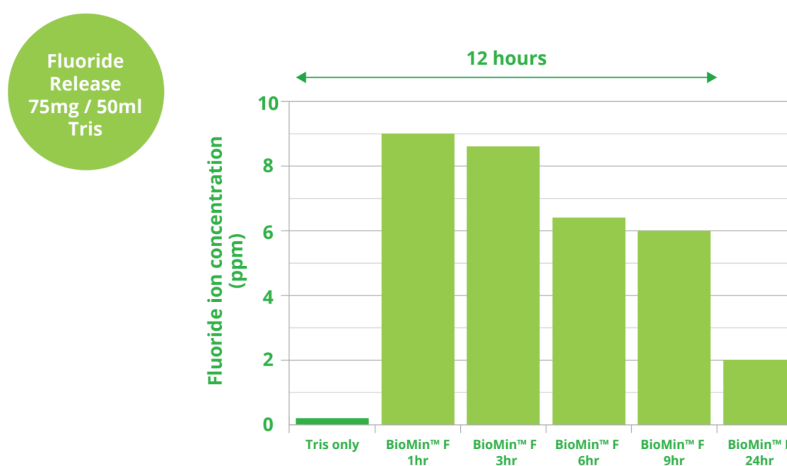
Generally our questions are based on our knowledge, the greater our knowledge on a topic the more questions we have to understand something further. Through recording the podcast with Professor Robert Hill and Richard Whatley, I learn't so much about BioMin F that my curiosity evolved around toothpaste on the additional benefits toothpaste could now have based on the active ingredients in 2020. Through understanding the mechanism of BioMin F I realised this toothpaste could essentially become a significant contributing factor that could reduce dental caries, if used and recommended correctly.

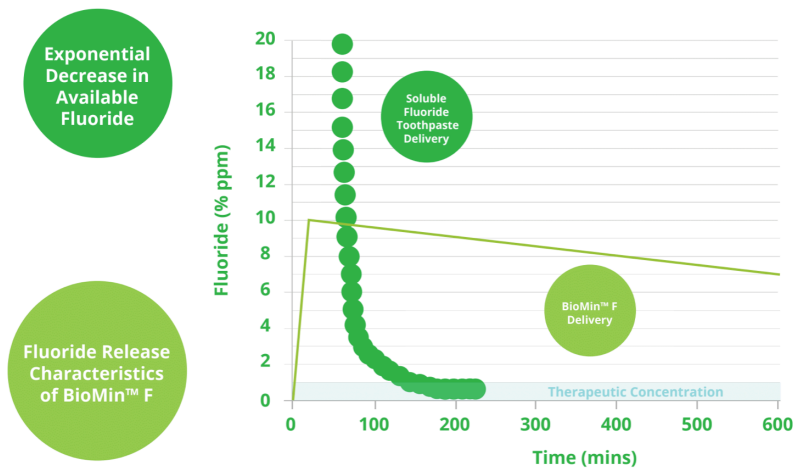
I have developed a pathway of questions that you could utilise as a dental profession in evaluating toothpastes that have been inspired from the current dental professions questions and BioMin F.

### So what is different about BioMin F?

BioMin F is a toothpaste containing glass materials that are able to slowly dissolve in saliva in up to 12 hours (as shown in table 2 and 3) adhering to dental tissues. This is a particular interesting unique fact about BioMin F that aligns with what Professor Ten Cate who stated that 'Fluoride needs to be deposited and slowly released'. There is only 600ppm fluoride in BioMin F the optimal amount to fluoride to benefit. Unlike other toothpastes this is a favourable characteristic of BioMin F, especially for patients concerned about fluorosis

Table 2 & 3



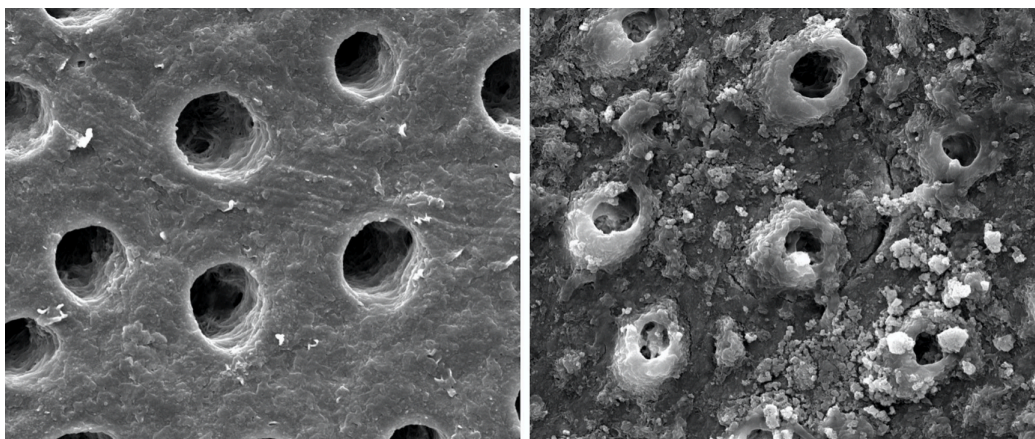


Although glass particles have been introduced into toothpaste previously such as with Novamin that contains calcium and phosphate. The fluoride was not integrated in the glass particle. The concentration of phosphate in the glass particle of the BioMin F toothpaste is much higher that accelerates the apatite formation. As the glass particles dissolve, the ions are released precipitating fluorapatite.

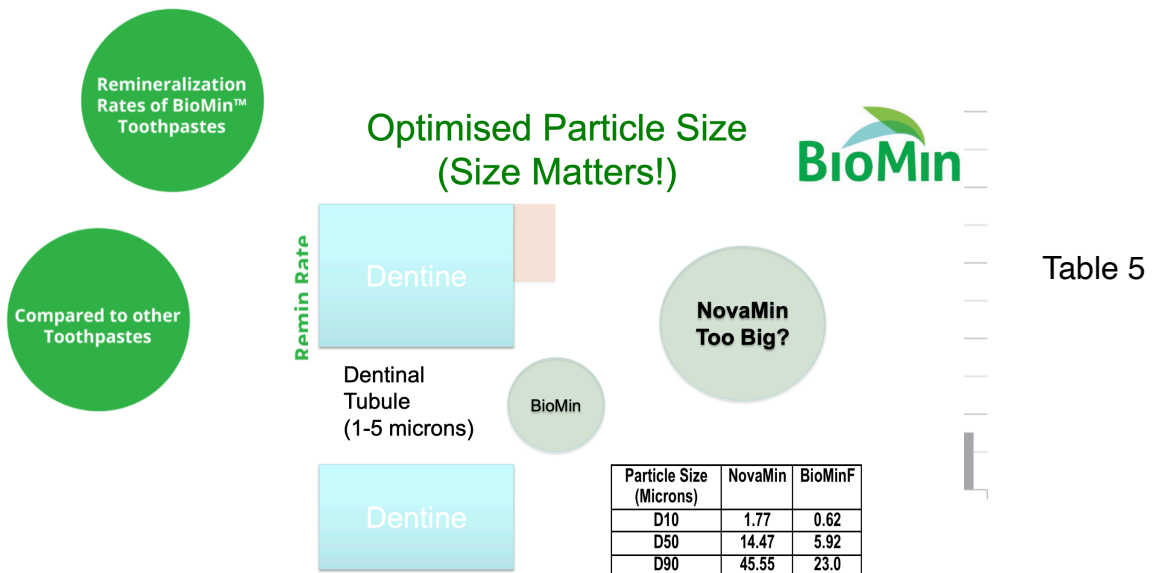
In a comparative clinical study of 160 patients, the BioMin F group showed significantly better results compared with either NovaMin, herbal, and potassium nitrate toothpastes in the treatment of dental hypersensitivity symptoms. (6) Some clinicians have been reporting up to 90% relief in hypersensitivity.

This is likely to be due to the size of the Bioactive glass materials outlined in Table 5. BioMin™ F has been developed to help reduce tooth sensitivity, and from the clinical trial the size of the glass particle helps replace lost mineral from tooth surfaces to protect against acid erosion as evident in table 4.

Table 4 show the dentinal tubules before and after brushing with BioMin F.

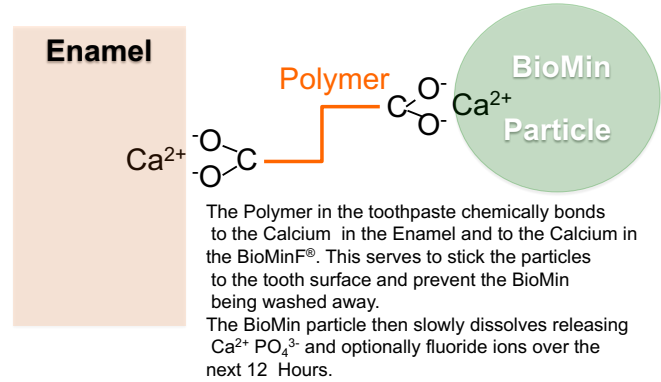


What is the particle size of the glass that helps reduce sensitivity through occluding the dentinal tubules as in the diagram above.-



The mechanism of bonding is perfectly shown in this image, it is important to remember the glass particles adhere to tooth surfaces for up to 12 hours.

### Schematic How BioMinF® Works



As with any toothpaste there are external variables that could limit the toothpastes effectiveness however if the toothpaste is used twice a day and the patient does no rinse or eat directly after. As Richard Whatley discusses in the podcast recording, it is also advisable to swirl the toothpaste around with your tongue to help distribution of the toothpaste around the mouth.

### How does the toothpaste react in a low pH?

Bioactive glasses dissolve faster under acidic conditions than neutral or basic conditions, this is significant for caries prone patients and patients who have a high sugar content in their diet, quickly raising the pH and releasing calcium phosphate and fluoride ions. The fluorapatite dissolves at about a pH unit less than hydroxyapatite at 1.5 pH.

### Conclusion

The content of this article has lead me to create the below toothpaste consideration pathway, that could be utilised by dental professionals as part of future toothpaste analysis.

### Toothpaste consideration pathway.

	What is the evidence?	What other questions could we be asking and why?
<b>Fluoride?</b>	There is sufficient evidence that support the inclusion of fluoride in toothpaste (2)	How long does the fluoride remain in the mouth? What is the source of the fluoride, ie soluble fluoride molecule or a fluoride containing bioactive glass. Is the fluoride delivery through a soluble fluoride molecule such as sodium fluoride, sodium monofluorophosphate. If the answer is yes then 1450ppm is recommended based on the evidence of soluble fluoride since it dilutes away in 90 minutes.
<b>SLS Free?</b>	There is currently insufficient evidence linking the use of SLS toothpaste as a causative factor for RAS (1)	What is the current evidence supporting this?  If the toothpastes is SLS free what surfactant has it been replaced with?
<b>RDA value?</b>	RDA of 250 or less is recommended	What are the other contributing factors that could be controlled that could be impacting tooth wear.
<b>Does the fluoride remain in the mouth for longer than 90 mins?</b>	Traditionally fluoride ions have been known to be diminish in 90 mins	How long does the fluoride remain in the mouth and through what mechanism is this achieved
<b>Clinical glass particle size</b>	The particle size appear optimal for deposition within the dentinal tubules and reduces abrasivity.	How does the glass particle size differ from other toothpastes that contain fluoride?
<b>How effective is the tooth paste at treating sensitivity?</b>	There is clinical evidence supporting the impact on sensitivity over a 4 week period.	For how long does the desensitisation last?
<b>What affect does the toothpaste have on the Ph?</b>	The lower the PH the faster the fluoride, calcium and potassium ions are released	How does the toothpaste contract the low ph?
<b>If patients could be susceptible to fluorosis</b>		There is lower fluoride concentration to this would reduce the risk of fluorosis.
<b>Does the toothpaste have a strong flavour?</b>		It is preferable the patient does not rinse so it could be a consideration to understand if the toothpaste is strong or mild in flavour

- (1) Effect of sodium lauryl sulfate on recurrent aphthous stomatitis: A systematic review. *J Oral Pathol Med.* 2019 May;48(5):358-364. doi: 10.1111/jop.12845. Epub 2019 Mar 27. Ali BY1, Erinoso OA2, Olawuyi AB3.
- (2) Fluoride mouthrinses for preventing dental caries in children and adolescents - 29 July 2016. Marinho VCC, Chong L, Worthington HV, Walsh T
- (3) Delivering better oral health: an evidence-based toolkit for prevention  
Third edition, Department of Health, Public Health England.
- (4) Fluoride toothpastes for preventing dental caries in children and adolescents 20 January 2003. Marinho VCC, Higgins J, Logan S, Sheiham (deceased) A
- (5) Triclosan/copolymer containing toothpastes for oral health, Riley P, Lamont T, 5 December 2013
- (6) Abrasivity of dentifrices from a clinical perspective. Dörfer CE. (2010) *J Clin Dent.* 21 (Suppl): S4.