

D3G DISPATCH

News about Developmental Dental Defects (D3s), The D3 Group, and the Chalky Teeth Campaign.

COMMENT ——— FROM THE CUSP

***Jeepers creepers**, it's March already and our big summer break seems long ago — hopefully 2019 is unfolding well for you all as it is for us. News continues to pile up as do great new publications, so this newsletter's mission to inform and educate is easily met (from our side of the table, at least).*

As it happens, this Issue has picked up a theme around **learning** and **communication**. We introduce a pioneer in "chalky teeth" communications and explore the linguistic challenges we face in extending our Chalky Teeth Campaign around the world. Some two-way learning experiences at recent events, and emerging ideas about using our expert membership to help improve research questioning, are shared. Those who think our field will benefit by returning to a whole-dentition viewpoint, rather than today's blinkered gaze at a few index teeth, will also find support. And due to much enthusiasm expressed about the clinical segment introduced last Issue, another "**Wow Factor**" pic is presented for your consideration.

Finally, I really wanted to say something about **Christchurch**, both as an emotionally battered **Kiwi**, a proud **Australasian** and an ever-optimistic **humanist**. Yet I remain lost for anything succinct after days of thinking about it. Therefore I'll simply ask that you join New Zealand's inspiring leadership in recognising this situation as a hugely sad learning experience from which we can all work to make the world a better place — **salaam/peace**, and **ko tatou, tatou/we are one**.

D3-Mike | Mike Hubbard
D3G Founder-Director



See the inspiring story behind this pic [here](#)

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REPORT: Two-way learning experiences

What we recognise today as **D3G's translational mission** and **cross-sector approach** started out with a "mad scientist" and a handful of practitioners wondering how they could deliver on a **benefaction** aimed at doing good for children. The many accomplishments since then reflect on a multitude of **conversations with diverse stakeholders** — and just as **good science** is based on **identifying key questions** as much as it is about finding **valid answers**, many of D3G's learning experiences involved establishing **common conceptual ground** before identifying **important unknowns**. Recent happenings have provided two instances that illustrate these points.

In February, **D3-Mike** joined **Kiwi D3Gers**, paediatric orthodontist **Peter Barwick** and paedodontist **Arun Natarajan**, to deliver a **full-day continuing education event** to members of the **NZ Dental Association (NZDA)** in Auckland and Christchurch. The program was essentially a longer version of that served up in our **Colgate America webinar**, with extra time spent on **research** and **case analyses** — the latter were expertly guided by the two clinicians and deliberately involved (*spontaneous*) participation from various dental subsectors represented within the audience. This was a simply wonderful **two-way learning experience**, for the scientist amongst us as much as for the audience. Exciting stories emerged, not only about problems faced but also about progress being made in different hotspots of awareness across the "**Shaky**



Isles". It was clear from comments made during and after the events that those two days led to important bridges being built across the nation — we hope to report more detail on this soon. Our thanks to the **95 attendees** for their contributions, and to **NZDA** for this opportunity and their **donation to the Chalky Teeth Campaign**.

Secondly, the **Australian and New Zealand Society of Paediatric Dentistry** kindly hosted D3G at their recent **RK Hall lectures** meeting in **Perth**, providing **D3-Mike** the opportunity to both share and absorb new information related to this key component of our membership — and in respect of our thoughts above, the ever-improving level of communication between scientist and clinicians led to some important progress with forthcoming educational and research initiatives (*more on them soon too!*).

TRANSLATIONAL STEPS: Internationalising "Chalky Teeth"

A recent report by **Germany's Federal Institute for Risk Assessment (BfR)** is doubly interesting because it weighs up **dental developmental safety** of food-based exposures to **BPA (bisphenol A, a component of some plastics)** and in so doing makes repeated references to "**kreidezahne**" (i.e. "**chalky teeth**" in German). BfR's use of this public-friendly term in an introductory setting fits with their stated focus on **helping people as consumers**, and is followed by more-technical language deeper in the document. Whether or not this example and many other online usages of "chalky teeth" stem from our '**Chalky Teeth Campaign**', it's pleasing to witness growing use of what seems (*in our English language at least*) to be a simple and intuitive **descriptor for D3s**.

So, as we seek to **internationalise our Campaign and D3G**, how might the terminological aspects best be handled? — yes, our translational mission (*research & education*) is quite literally facing questions about (*linguistic*) translation! Might it be better to leave

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speakers of other languages to translate as they see fit, or should we seek to have them adopt "chalky teeth" as a [loan word](#). We've learned that various languages do and don't use "chalky" as an adjective – for example, "chalky teeth" translates nicely into **French** as "[dents crayeuse](#)" whereas the 2013 media release from our Campaign launch migrated into **Spanish** less tidily as "[dientes de tiza](#)" ("**teeth of chalk**"). As the upcoming translation of [Sam's storybook](#) into Spanish and other languages will provide a watershed for these decisions, we welcome your thoughts on what will work best in your daily lives around the globe (contact [Mike](#)).

And back to the question "**does BPA cause Molar Hypomin?**" (as proposed in several recent reports based on animal studies), we can simply summarise that after 5 pages of critical analysis the BfR concluded that "**a direction connection between BPA and MIH appears unlikely in humans**". Key factors weighed up included metabolic differences between young rats and human infants, and allied toxicological differences in the extent of food-based exposures to BPA. Read more [here](#).

FOLLOW-UP: Popularity of amalgam

In our [previous Issue](#) we discussed D3G member **Azza Tagelsir's** article on US paedodontists' knowledge about **Molar Hypomin** and expressed our surprise (echoed by many readers) that nearly half use amalgam to restore hypomineralised 6-year molars. While this unexpectedly high figure remains true, **Azza** spotted our misstatement that amalgam was the most-used (rather than least-used) material for 24% of respondents — we apologise for this mistake. Azza has kindly provided additional data ([Table](#), the red numbers don't appear in her paper) which shows that only 2% reported amalgam as their most-used material, leaving it ranked 5th overall ahead of compomer and cast restorations (cf. *Never Used* column). While less shocking than before, questions linger as to why amalgam is still used so often? — and conversely, why are some alternatives overlooked by so many (e.g. 28% Never Use GIC)? Similar surveys elsewhere have revealed a strong bias for GICs over amalgam. Way back in 2008 for example, 83% and 20% of Australasian paedodontists

Restoration type	Most used	Used sometimes	Rarely used	Never used
Stainless steel crown	32%	61%	5%	3%
Composite resin	29%	45%	14%	12%
Resin-modified GIC	22%	42%	13%	24%
Glass ionomer cement (GIC)	17%	41%	14%	28%
Amalgam	2%	21%	24%	53%
Compomer	4%	15%	8%	72%
Cast restoration	0%	3%	5%	92%

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Never Used amalgam and GICs, respectively [[ref](#)] whereas more recently GIC was preferred 10-fold over amalgam in Saudi Arabia [[ref](#)]. Conversely, we note a prominent 2005 study showing that, **sometimes**, amalgams can last quite well in this context [[ref](#)]. We agree with Azza that this topic not only deserves further investigation, but **polling of our "D3-savvy" membership** should be informative for future survey design — your comments on this idea are welcomed (contact [Azza](#) or [D3-Sharon](#)).

INTRODUCING: Marilyn Owen, D3G's first 'Chalky Teeth Champion'

Today we happily introduce **Marilyn Owen** who two and a half years ago became the first practitioner in our '**We Fight Chalky Teeth**' specialist network ("[WFCT](#)"). With more than **30 paedodontists and orthodontists** now involved across Australia and New Zealand, it's timely to recount how this '**Champions in the Fight against Chalky Teeth**' initiative came about.

During her specialist training in paediatric dentistry at the University of Melbourne, Marilyn had many interactions with **D3-Mike** relating both to her investigation of "[chalky 2-year molars](#)" (published [here](#) and discussed in [Issue 4](#)) and her photographic expertise which underpins many clinical images used by D3G. She also helped D3G secure two educational grants from the **Wrigley Foundation** and previewed her research at the launch of our [website](#) and [Chalky Teeth Campaign](#) in 2013.

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Pleasingly, when Marilyn subsequently established [Tasmania's](#) first paediatric dental practice, not only was it replete with [D3G educational materials](#) but her website also had what became known as the "[Chalky Teeth Campaign satellite page](#)". She has since helped develop [WFCT](#) and also spread the word about "chalky teeth" amongst healthcare professionals and the public while serving as [D3G's Tasmanian representative](#). Reflecting

on this experience, Marilyn says that using "chalky teeth terminology" to start conversations has proven a refreshing change for her patients and their families, sparking interest from parents and children alike. Colouring this viewpoint, she had spent a decade in various general practice settings (*school dental service, rural government, metro private*) before deciding to specialise. For more info [contact Marilyn](#).

WOW FACTOR: A diagnostic dilemma?

Such was the positive reaction to [last issue's](#) case analysis (*before/after pics of a chalky 6-year molar undergoing post-eruptive breakdown, remember?*) that we've decided to continue this segment — subject of course to readers supplying suitably "interesting D3 cases" (please contact [D3-Mike](#)).

The issue

We know that upper front teeth (*incisors*) are at particular risk of decay when toddlers are allowed to sleep with their bottles (*so called baby bottle or nursing decay*). Alternatively, incisors might appear chalky and discoloured due to developmental issues (i.e. **incisor hypomineralisation** — which can occur standalone or as part of [Molar Hypomin](#)). So what then to make of this case?

The wow

The picture shows 4 discoloured upper incisors in a two-and-a-half year old boy with no medical history of note. Examination showed all his other teeth to be "near perfect" (*no decay, no hypomin molars or other D3s other than one small enamel pit*) and oral hygiene was excellent despite sensitivity when brushing the incisors. The brown teeth reportedly **erupted like this** and the enamel was found to be "extremely soft and just peels away". The broken incisal edges were attributed to numerous falls after the teeth erupted, and the teeth had become infected leading to extraction soon after this picture was taken.

Questions arising

If this is "[early childhood decay](#)" (*as reported by the hospital that did the extractions*) then how do we explain the precise restriction to just these 4 teeth? — we note



he was still being breastfed at two, but lack information about frequency thereof. And if this is a severe case of "**incisor hypomin**", how might we rationalise the unaffected lower incisors? — can we look to siblings, asking whether this is an isolated case? **Can this be fixed?** — now that the teeth are extracted and the child is again a "[happy chappy](#)", it's just a matter of waiting until his adult teeth erupt. **Translational message?** — as D3G's definition of "chalky teeth" incorporates [decay in addition to D3s](#), this case might well be discussed publically under that framework. Certainly, there appears no reason to blame the parents for dental neglect based on the available information. Many thanks to D3G's remotest member, **Penelope Hunstock** (see [Issue 7](#)), for sharing this intriguing case from [Christmas Island](#). And those of you with strong ideas about this diagnosis, please email us so we may share them in the next Issue.

QUICK QUIZ: Delving into D3s

QUESTION 1 (easy)

A key feature of **Molar Hypomin** is that anywhere between one and all four molars of any type (e.g. 2-year molars) can be affected — true or false?

QUESTION 2 (harder)

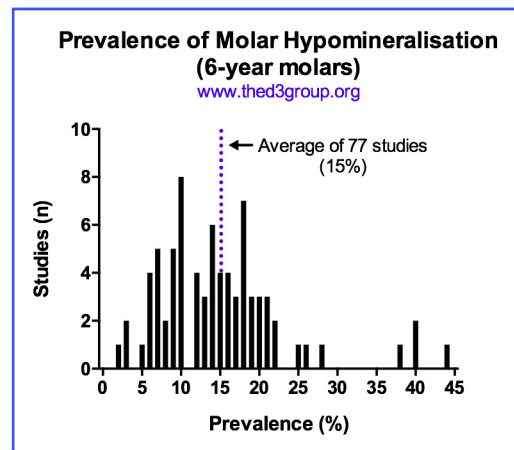
Modern population studies show that **enamel hypoplasia** is similarly prevalent as **Molar Hypomin** (*demarcated opacities*) — true or false?

Answers: see [Suggestions Box](#) on pg 6.

D3 LITERATURE: Keeping you current!

Clinical Feature: Why are Molar Hypomin prevalence data so varied?

As discussed recently ([Issue 5](#)), **Molar Hypomin prevalence** data are as notable for their **heterogeneity** as they are for their disturbingly **high average values** — the **Figure** illustrates this situation as it applies to 77 studies of "chalky 6-year molars" (see [data for 2-year molars here](#)). Supposed reasons for this variation include **lack of standardisation** at various experimental levels including clinical examinations and subject populations. A new publication by D3G member, **Birgitta Jalevik**, addresses two likely contributors to this diversity — **training of examiners** and **subject age** at time of examination. This work builds on a [2018 study](#) where Birgitta and colleagues essentially took a step back in time and examined **DDEs** across the **whole permanent dentition** rather than adopting the abbreviated focus on 6-year molars and incisors that is modern-day "MIH". The present study reexamined children from the 2018 report after a gap of 3 years and found that most (73%) earlier DDE diagnoses remained valid. The main divergences were reassignment of **demarcated opacities** as **diffuse opacities** plus recognition that many cases previously regarded **chronological** were now seen to be **non-chronological** (*i.e. because additional affected teeth had erupted*). Consequently, the **prevalence of "MIH" decreased by about a third** due to involvement of other teeth and



DDEs. Secondly, the study revealed that examiners trained for the 2018 study largely **retained their "DDE smarts" 2 years later** whereas untrained clinicians struggled to diagnose DDEs (85% and 42% correctness, respectively). These findings reinforce **D3G's scientifically-biased viewpoint** that diagnostic descriptions should focus on tooth-, not case-, level (*e.g. demarcated opacities, instead of MH, MIH, IH, HSPM, DMH.....*) and embrace the **whole dentition** (*primary and permanent*) rather than a chronologically restricted handful of **index teeth**. Learn more about [Birgitta's study here](#) and D3G's evolving **definition of Molar Hypomin here** and [here](#).

Clinical Feature: Molar Hypomin is often a real pain!

Many **D3Gers** were surprised when a [2014 report](#) from Melbourne stated that "sensitivity was rare" in hypomineralised 6-year molars. It turns out this might've been a matter of varied expectations because the data actually revealed a "child-reported prevalence" of about 20% (*hardly "rare"?*). The point was also made that sensitivity didn't always parallel severity — often it was "mild" (*intact white*) opacities that hurt. While higher prevalences have been reported in a couple of other studies and numerous reports refer to sensitivity being a troubling aspect of **Molar Hypomin**, a major gap in quantitative analysis has remained until now. D3G member **Soraya Leal** and colleagues have "[grabbed this bull by the horns](#)" and undertaken a robust analysis incorporating two triggers (*air blast, scratch test*) and two sensitivity assessments (*child, clinician*) with internal controlling (*i.e. comparing hypomineralised and unaffected 6-year molars in the same mouth*). Overall, **35% of Molar Hypomin cases were judged sensitive**, with the pain being more responsive to air blast than scratching and generally

MIH severity	Hypersensitivity	
	yes	no
Mild (MIH 1)	56 (29.7%)	132 (70.3%)
Moderate (MIH 2)	11 (55%)	9 (45%)
Severe (MIH 3)	16 (51.6%)	15 (48.4%)

higher in severe cases. **On average**, pain was assessed as being **low grade** but the data exhibited wide variation — meaning that many children had good reason to say otherwise! We also note that, although sensitivity was more common in severe and moderate lesions **relative to mild** (see [Table](#)), on an **absolute basis** it was actually **mild lesions** that were responsible for **most sensitivity numerically** (56/83 affected molars = 67%). We think these findings strongly substantiate sensitivity as being a **common problem** associated with Molar Hypomin, and that further robust investigations of this type are needed. Read more [here](#).

Other New Reports: Spotighting Molar Hypomin and Amelogenesis Imperfecta

Prevalence and etiology of molar-incisor hypomineralization (MIH) in the city of Istanbul. Koruyucu M, Özel S, Tuna EB. *J Dent Sci*. 2018; 13(4):318-328. PMID: [30895140](#)

A clinical and radiographic investigation comparing the efficacy of cast metal and indirect resin onlays in rehabilitation of permanent first molars affected with severe molar incisor hypomineralisation (MIH): a 36-month randomised controlled clinical trial. Dhareula A, Goyal A, Gauba K, Bhatia SK, Kapur A, Bhandari S. *Eur Arch Paediatr Dent*. 2019; [Epub ahead of print] PMID: [30888581](#)

The Prevalence and Severity of Molar Incisor Hypomineralization and Molar Hypomineralization in Dubai, UAE. Hussain G, Al-Halabi M, Kowash M, Hassan A. *J Dent Child (Chic)*. 2018; 85(3):102-107. PMID: [30869585](#)

Impact of molar incisor hypomineralization on quality of life in children with early mixed dentition: A hierarchical approach. Portella PD, Menoncin BLV, de Souza JF, de Menezes JVNB, Fraiz FC, Assunção LRDS. *Int J Paediatr Dent*. 2019; [Epub ahead of print] PMID: [30758096](#)

Prevalence of molar incisor hypomineralisation has a North-South gradient between Europe and North Africa. Vieira AR. *Eur Arch Paediatr Dent*. 2019; [Epub ahead of print] PMID: [30726548](#)

The impact of MIH/HSPM on the carious lesion severity of schoolchildren from Talca, Chile. Gambetta-Tessini K, Mariño R, Ghanim A, Calache H, Manton DJ. *Eur Arch Paediatr Dent*. 2019; [Epub ahead of print] PMID: [30637683](#)

Molar-Incisor Hypomineralization and Cleft Lip and Palate. Vieira AR. *Ann Plast Surg*. 2019; 82(2):252. PMID: [30628943](#)

Knowledge, perceptions, and clinical experiences on molar incisor hypomineralization among dental care providers in Hong Kong. Gamboa GCS, Lee GHM, Ekambaram M, Yiu CKY. *BMC Oral Health*. 2018; 18(1):217. PMID: [30545337](#)

Etiology of Hypomineralized Second Primary Molars: A Prospective Twin Study. Silva MJ, Kilpatrick NM, Craig JM, Manton DJ, Leong P, Burgner D, Scurrah KJ. *J Dent Res*. 2019; 98(1):77-83. PMID: [30074848](#)

For more Molar Hypomin reports go [here](#) >

Canine models of human amelogenesis imperfecta: identification of novel recessive ENAM and ACP4 variants. Hytönen MK, Arumilli M, Sarkiala E, Nieminen P, Lohi H. *Hum Genet*. 2019; [Epub ahead of print] PMID: [30877375](#)

Full-mouth Rehabilitation of Hypocalcified-type Amelogenesis Imperfecta With Chairside Computer-aided Design and Computer-aided Manufacturing: A Case Report. Moussally C, Fron-Chabouis H, Charrière A, Maladry L, Dursun E. *Oper Dent*. 2019; [Epub ahead of print] PMID: [30849013](#)

Complete rehabilitation of compromised full dentitions with adhesively bonded all-ceramic single-tooth restorations: Long-term outcome in patients with and without amelogenesis imperfecta. Klink A, Groten M, Huettig F. *J Dent*. 2018; 70:51-58. PMID: [29275170](#)

Amelogenesis imperfecta: therapeutic strategy from primary to permanent dentition across case reports. Toupenay S, Fournier BP, Manière MC, Ifi-Naulin C, Berdal A, de La Dure-Molla M. *BMC Oral Health*. 2018; 18(1):108. PMID: [29907114](#)

Amelogenesis imperfecta: A novel FAM83H mutation and characteristics of periodontal ligament cells. Nowwarote N, Theerapanon T, Osathanon T, Pavasant P, Porntaveetus T, Shotelersuk V. *Oral Dis*. 2018; 24(8):1522-1531. PMID: [29949226](#)

Crown therapy in young individuals with amelogenesis imperfecta: Long term follow-up of a randomized controlled trial. Lundgren GP, Vestlund GM, Dahllöf G. *J Dent*. 2018; 76:102-108. PMID: [30004001](#)

SLC10A7 mutations cause a skeletal dysplasia with amelogenesis imperfecta mediated by GAG biosynthesis defects. Dubail J, Huber C, Chantepie S, Sonntag S, Tüysüz B, Mihci E et al. *Nat Commun*. 2018; 9(1):3087. PMID: [30082715](#)

Enamel renal syndrome: A novel homozygous FAM20A founder mutation in 5 new Brazilian families. Dourado MR, Dos Santos CRR, Dumitriu S, Iancu D, Albanyan S, Kleta R, Coletta RD, Marques Mesquita AT. *Eur J Med Genet*. 2018; [Epub ahead of print] PMID: [30394349](#)

Parental Perception of Children Affected by Amelogenesis Imperfecta (AI) and Dentinogenesis Imperfecta (DI): A Qualitative Study. Alqadi A, O'Connell AC. *Dent J (Basel)*. 2018; 6(4). PMID: [30453633](#)

Mutations in RELT cause autosomal recessive amelogenesis imperfecta. Kim JW, Zhang H, Seymen F, Koruyucu M, Hu Y, Kang J, Kim YJ, Ikeda A, Kasimoglu Y, Bayram M, Zhang C, Kawasaki K, Bartlett JD, Saunders TL, Simmer JP, Hu JC. *Clin Genet*. 2019; 95(3):375-383. PMID: [30506946](#)

Skeletal open bite with amelogenesis imperfecta treated with compression osteogenesis: a case report. Mori H, Izawa T, Mori H, Watanabe K, Kanno T, Tanaka E. *Head Face Med*. 2019; 15(1):3. PMID: [30691484](#)

Experiences of Being a Parent to a Child with Amelogenesis Imperfecta. Pousette Lundgren G, Hasselblad T, Johansson AS, Johansson A, Dahllöf G. *Dent J (Basel)*. 2019; 7(1). PMID: [30744129](#)

Towards better understanding and care of people with D3s.

SUGGESTIONS BOX

In D3 family spirit, please **contact us** to share your thoughts on how we might improve this newsletter and other communications.

Answers to quiz:

Q1: True, and we refer to this as a "sporadic" presentation (*more about this [here](#) and [here](#)*)

Q2: False — while this once was true, enamel hypoplasia has undergone a relative decrease in recent times presumably due to improvements in paediatric healthcare (*learn more [here](#)*)