GC Tooth Mousse & GC Tooth Mousse Plus

A WORLD OF PROOF

RESEARCH STUDIES FROM AROUND THE GLOBE

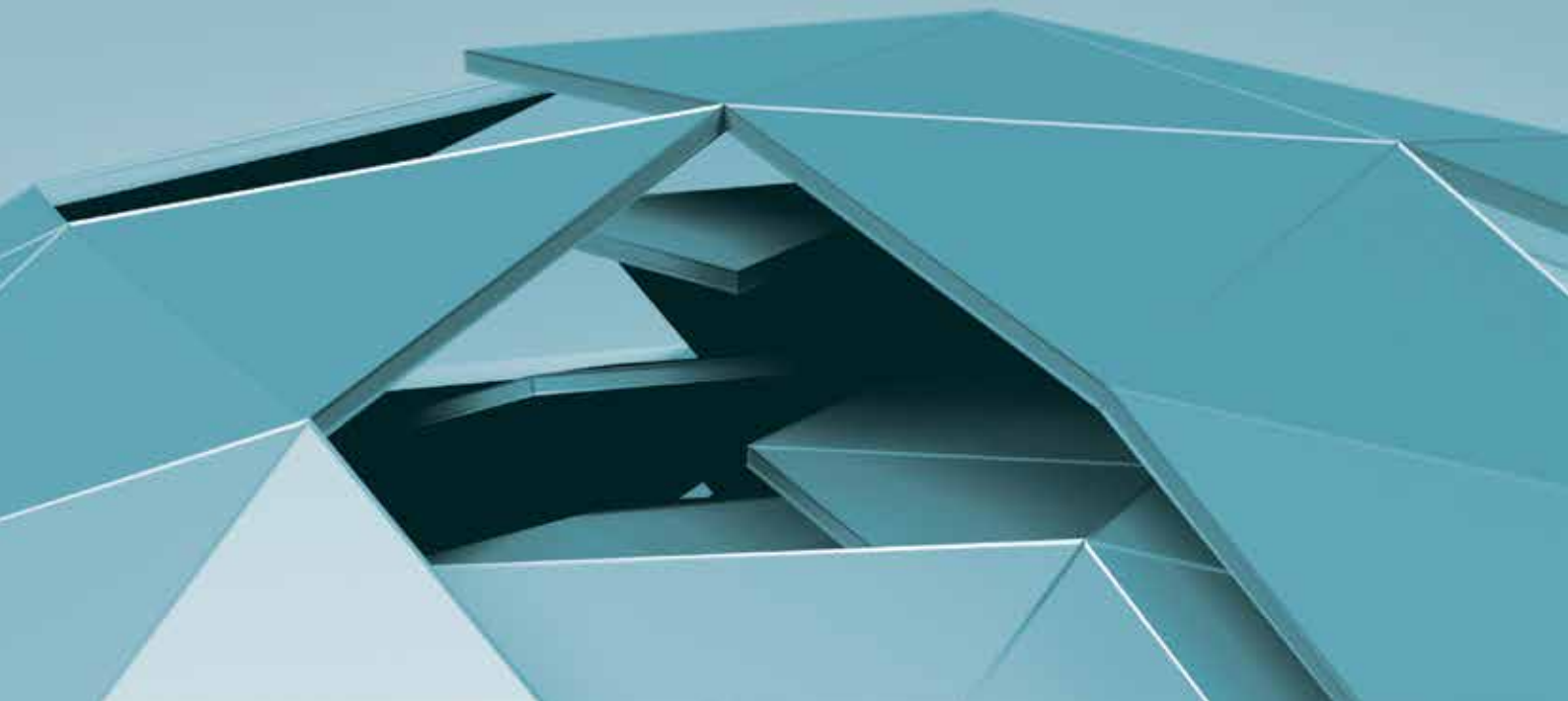


Discover the world of GC Tooth Mousse & GC Tooth Mousse Plus

As more and more dental professionals discover the benefits that GC Tooth Mousse and GC Tooth Mousse Plus deliver to their patients, researchers all around the world are investigating and documenting the clinical and laboratory evidence of their effectiveness.

The volume and extent of supportive independent research on GC Tooth Mousse and GC Tooth Mousse Plus, as summarised in this booklet, clearly emphasises the global significance of these remarkable products.





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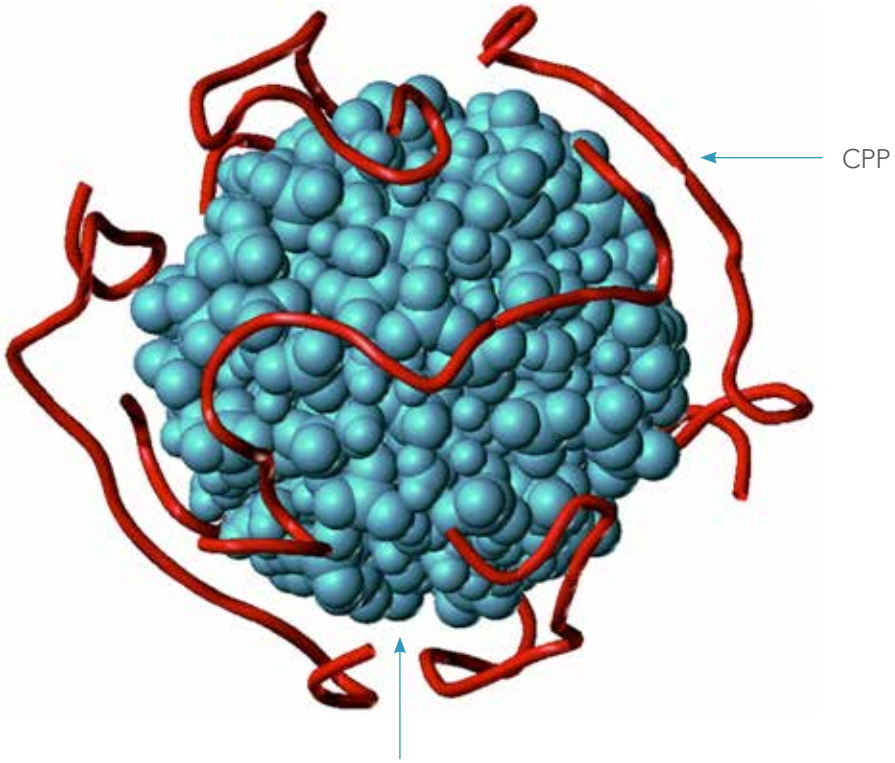
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RECALDENT™ (CPP-ACP)

GC Tooth Mousse is a great tasting water-based crème that contains RECALDENT™ (CPP-ACP), casein phosphopeptide amorphous calcium phosphate, a milk-derived protein that provides high concentration bio-available calcium and phosphate. GC Tooth Mousse Plus has the added benefit of 900 ppm fluoride, which approximates the level of fluoride present in adult strength toothpastes. GC Tooth Mousse Plus is recommended for children at least 6 years old and older patients where additional fluoride exposure is desired.
When GC Tooth Mousse or GC Tooth Mousse Plus are applied in the oral environment, RECALDENT™ (CPP-ACP) binds to biofilms, plaque, bacteria, hydroxyapatite and soft tissue localising calcium, phosphate (and fluoride).

Molecular model of CPP-ACP nano complex (RECALDENT™)



Key **F** Fluoride **QLF** Quantitative Light Fluorescence **PLM** Polarising Light Microscopy **RCT** Randomised Controlled Trial **WSL** White Spot Lesions **GI** Glass-ionomer **CPP-ACP** Casein Phosphopeptide-Amorphous Calcium Phosphate **SBS** Shear Bond Strength **HCl** Hydrochloric acid **TCP** Functionalised tri-Calcium Phosphate

Key research-proven benefits

RECALDENT™ (CPP-ACP) is the end result of many years of research by the University of Melbourne into the anticariogenic properties of milk. Within the oral environment, RECALDENT™ (CPP-ACP) binds to biofilms, plaque, bacteria, hydroxyapatite and soft tissue, localising high levels of water soluble calcium, phosphate (and fluoride).

Synergises with fluoride[a–i]

CPP-ACP promotes the incorporation of fluoride into plaque and sub-surface enamel, producing effects superior to those that can be achieved by using fluoride alone.

Buffers plaque acid[m–r]

In a recent clinical study, application of GC Tooth Mousse elevated plaque pH levels for 48 hours, while application of GC Tooth Mousse Plus elevated plaque pH levels for 96 hours.

Inhibits demineralisation and promotes subsurface enamel remineralisation[e–l]

CPP-ACP is the only proven technology that promotes sub-surface enamel remineralisation.

Acts as a prebiotic[m–r]

CPP-ACP suppresses the growth of Streptococcus mutans and encourages the selection of commensal (good) bacteria.





a) Garry et al.(2015). ORCA abstract 133 Caries Res 49:297-369. b) Hicks, Flaitz (2013). J Dent Res 92 (Spec Iss A): 773. c) Katsura et al.(2010). Niigata Dent. J. 40(1):53-57. d) Duraisamy et al. (2015). J Pharm Bioallied Sci. 7(Suppl 2):S513-517. e) Akin M, Basciftci FA. (2012). Angle Orthod.82:770-775. f) Cochrane et al. (2010) J Dent Res 89(11):1187-1197. g) Shen et al.(2011) J Dent 39:518-525. h) Robertson et al. (2011) Am J Orthod Dentofacial Orthop 140(5):660-668. i) Srinivasan et al. (2010) Arch Oral Biol 55:541-544. j) Sakaguchi et al. (2006) J Dent Res 85(Spec Iss B):0191. k) Bailey et al. (2009) JDent Res 88:1148-1153. l) Cochrane et al.(2009) ORCA abstract 42. Caries Res 43:179-244. m) Emamieh et al.(2015) Novelty in Biomedicine 3(1)33-37. n) Pukallus et al.(2013) Pediatr Dent 35(7):550-555. o) Cochrane NJ, Reynolds EC (2012) Adv Dent Res 24(2):41-47. p) Sato et al. (2011) J Dent Res 90 (Spec Iss B): 4174. q) Heshmat et al. (2013) J Dent Res 92 (Spec Iss B): 82902. r) Connor et al. (2014) J Dent Res 93 (Spec Iss A): 270.

Key **AFM** Atomic Force Microscopy **RMGI** Resin-modified Glass-ionomer **MIH** Molar Incisor Hypomineralisation **TM** GC Tooth Mousse
NaF Sodium Fluoride **APF** Acidulated Phosphate Fluoride **XRD** X-ray Diffraction **MSBS** Microshear Bond Strength **TMP** GC Tooth Mousse Plus

Published results from key research fields

HIGH CARIES RISK PATIENTS

GC Tooth Mousse suppresses the growth of Streptococcus mutans on desiccated glass-ionomer and resin-modified glass-ionomer materials.
Connor et al.[36]

GC Tooth Mousse and GC Tooth Mousse Plus reduce caries lesion depth in enamel and dentine.
Kraft et al.[82]
Wright et al.[172]

GC Tooth Mousse reduces plaque acid production.
Caruana et al.[27]
Pukallus et al.[117]
Reynolds, Walsh[127]

GC Tooth Mousse and GC Tooth Mousse Plus increase plaque pH.
Aytepe et al.[10]
Heshmat, Abdian, Faraji[57]
Özdas et al.[107]
Peric et al.[110]

GC Tooth Mousse and GC Tooth Mousse Plus bind to Streptococcus mutans and increase calcium and phosphate levels in plaque.
Amornpipithkul ,Sanguansin, Leelataweewud[7]
Rose[130]
Rose[131]
Rahiotis, Vougiouklakis, Eliades[119]
Sato et al.[136]

GC Tooth Mousse and GC Tooth Mousse Plus reduce the level of cariogenic bacteria.
Erdem et al.[44]
Subramaniam, Naidu[144]
van der Veen et al.[158]

GC Tooth Mousse Plus reduces plaque area, plaque maturity and plaque acid production.
Tabatabaee, Walsh[147]

GC Tooth Mousse and GC Tooth Mousse Plus increase saliva buffering capacity and salivary concentration of calcium and phosphate ions.
Venkiteswaran, Awang, Rahim[161]

REVERSING ACTIVE WHITE SPOT LESIONS

GC Tooth Mousse and GC Tooth Mousse Plus remineralise and reduce the size of white spot lesions.
Aykut Yetkiner et al.[9]
Bröchner et al.[23]
Calazans et al.[26]
Ferrazzano et al.[45]
Hegde, Moany[56]
Juntavee et al.[70]
Kariya et al.[76]
Kitasako et al.[80]
Kutuk, Firat, Gurgan[85]
Manton et al.[92, 93]
Memarpour et al.[98]
Mielczarek[99]
Peric et al.[110]
Reynolds et al.[125]
Rypel et al.[132]
Sakaguchi et al.[134]
Shen et al.[140]
Vashisht et al.[159]
Yazicioglu et al.[179]
Yazıcıoglu, Ulukapı[178]
Zhou et al.[185]

SENSITIVITY

GC Tooth Mousse reduces dentine hypersensitivity.
Duan et al.[39]
Freml et al.[47]
Mahesuti et al.[91]
Poitevin et al.[114]
Vlacic[162]
Walsh[165]

ORTHODONTICS

GC Tooth Mousse and GC Tooth Mousse Plus prevent WSL development during orthodontics and remineralise post-orthodontic WSL.
Akin, Basciftci[5]
Bailey et al.[11]
Behnan et al.[19]
Garry et al.[49]
Groisman et al.[53]
Mayne et al.[96]
Rodriguez et al.[129]
Robertson et al.[128]
Sudjalim et al.[145]
Ünlü et al.[156]
Wang, Yan, Wang[166]
Zhou, Sun, Zhu[184]

HYPOMINERALISED MOLARS

GC Tooth Mousse improves the morphology and microstructure of enamel in teeth affected by MIH.
Baroni et al.[15]

Application of GC Tooth Mousse improves the mechanical properties of enamel affected by MIH.
Batra et al.[16]

GC Tooth Mousse Plus accelerates the maturation of MIH enamel, elevating the concentrations of calcium and phosphate, with ratios of calcium to carbon similar to normal enamel. The treated surface has mineral crystals with a regular shape that are better organised, with less porosity and fewer interprismatic spaces.
Baroni, Bazzocchi, Marchionni[14]

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SALIVARY DYSFUNCTION

In xerostomic patients: a) GC Tooth Mousse prevents and arrests caries lesions. b) GC Tooth Mousse improves stimulated saliva flow rate and pH over time.
Vlacic[162]

ROOT CARIES

GC Tooth Mousse Plus provides a greater degree of root caries protection and reduces root caries lesion depth.
Epasinghe, Yiu, Burrow[43]
Garcia-Godoy et al.[48]
Hicks, Flaitz[59–61]
Trajtenberg, Flaitz, Hicks[154]
Vlacic, Meyers, Walsh[163]
Westerman et al.[168]
Westerman, Flaitz, Hicks[169]

RADIATION INDUCED XEROSTOMIA

GC Tooth Mousse recalcifies root surfaces in patients with radiation induced xerostomia.
Katsura et al.[77]

EROSION

GC Tooth Mousse substantially remineralises eroded enamel.
Ceci at al.[29]
Grewal, Kudupudi, Grewal[52]
Ramalingam, Messer, Reynolds[121]
Srinivasan, Kavitha, Longanathan[143]
Tantbirojn et al.[151]

GC Tooth Mousse and GC Tooth Mousse Plus prevent enamel and dentine erosion.
Chapman, Jones, West[31]
Carvalho et al.[28]
Dehghan et al.[38]
Kargul et al.[74]
Mielczarek, Michalik[100]
Souza e Silva et al.[142]

GC Tooth Mousse and GC Tooth Mousse Plus increase enamel and dentine resistance to subsequent acid challenge.
Dehghan et al.[38]
Kara, Ünlü[73]
Kargul et al.[74]
Mielczarek, Michalik[100]
Ranjitkar et al.[122]
Souza e Silva et al.[142]

GC Tooth Mousse reduces wine erosion in both enamel and dentine/cementum.
Piekarz et al.[111]

GC Tooth Mousse reduces enamel erosion under severe conditions, simulating heavy attrition and gastric regurgitation.
Vongsawan, Surarit, Rirattanapong[164]

TOOTH WHITENING

GC Tooth Mousse and GC Tooth Mousse Plus greatly decrease the intensity of post-whitening sensitivity, giving greater compliance.
Duan et al.[39]
Ng, Manton[102]
Poitevin et al.[114]
Sheharyar et al.[139]
Walsh[165]

GC Tooth Mousse and GC Tooth Mousse Plus do not interfere with the action of bleaching agents.
Borges et al.[20]
Borges et al.[21]
Lago et al.[86]
Manton et al.[94]

GC Tooth Mousse and GC Tooth Mousse Plus improve the aesthetic outcome following whitening treatment, by increasing mineral content in the enamel structure.
Lago et al.[87]

GC Tooth Mousse and GC Tooth Mousse Plus reduce the propensity for freshly bleached teeth to be stained by smoking or drinking tea.
Imamura et al.[66]
Publio et al.[116]
Singh et al.[141]

INFLUENCE ON ADHESION/BONDING

Application of GC Tooth Mousse and GC Tooth Mousse Plus improves demineralised enamel bonding to a level equivalent to sound enamel bonding.
Mobarak, Ali, Daifalla[101]

Application of GC Tooth Mousse to enamel improves the micro-tensile bond strength for Optibond all-in-one* and it does not affect the microtensile bond strength for Optibond FL*, Clearfil SE bond*, and Adper Single Bond 2*.
Panich, Thanyakoop[109]

Exposure for 1 week to GC Tooth Mousse does not adversely affect the physical properties of desiccated glass ionomer (GI) and resin modified glass ionomer (RMGI) materials..
Connor et al.[37]

Application of GC Tooth Mousse prior to orthodontic bracket bonding significantly increases SBS of orthodontic brackets and does not compromise brackets bond strength.
Xiaojun et al.[180]

Clinicial trials and laboratory studies from around the world



Clinical Trials

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Europe/North Africa

Clinical Trials

BELGIUM

Author: Poitevin et al.[114]

Year: 2004

Location: Leuvin

Design: Cohort study, N=61 subjects, over 21 days.

Outcomes: TM reduced sensitivity to air and tactile stimuli.

DENMARK

Author: Bröchner et al.[23]

Year: 2011

Location: Copenhagen

Design: RCT, N=60 subjects, over 4 weeks.

Outcomes: The mean area of WSL decreased by 58% in the TM group and by 26% in the fluoride group.

HOLLAND

Author: van der Veen et al.[158]

Year: 2009

Location: Amsterdam

Design: RCT, N=34 subjects, over 12 weeks.

Outcomes: TMP induced a reduction in cariogenic bacteria, while the placebo paste did not.

ITALY

Author: Baroni et al.[15]

Year: 2010

Location: Bologna

Design: Cohort study, N=30 children, 3 years.

Outcomes: TM improved the morphology and microstructure of enamel in teeth affected by MIH.

Author: Baroni, Bazzocchi, Marchionni[14]

Year: 2012

Location: Bologna

Design: Enamel fragments from newly erupted MIH molar cusps were analysed after 6 months of TMP application.

Outcomes: TMP accelerated the maturation of MIH enamel, elevating the concentrations of calcium and phosphate, with ratios of calcium to carbon similar to normal enamel. The treated surface had mineral crystals with a regular shape that were better organised, with less porosity and fewer interprismatic spaces.

POLAND

Author: Kowalczyk et al.[81]

Year: 2006

Location: Poland

Design: Cohort study, N=13 subjects, over 4 weeks.

Outcomes: For treatment of dentine hypersensitivity, a single application of TM gave immediate relief on response to air stimulation. There was no further treatment so relapse occurred.

SERBIA

Author: Peric et al.[110]

Year: 2015

Location: Belgrade

Design: RCT to evaluate efficacy of TM and TMP among patients with Sjögren's syndrome (SS).

Outcomes: The use of TM and TMP contributed to a significant rise in plaque pH. TM and TMP enhanced remineralisation potential compared with NaF mouthrinse in patients with SS.

SPAIN

Author: Llena, Leyda, Forner[89]

Year: 2015

Location: Valencia

Design: Double-blind RCT to evaluate the effects of TM, TMP and fluoride varnish on the remineralisation of 786 WSL over a 12-week follow-up period.

Outcomes: At 4 weeks, TMP was superior to fluoride varnish at remineralising smooth-surface WSL.

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TURKEY

Author: Akin, Basciftci[5]

Year: 2011

Location: Konya

Design: Experimental prospective clinical controlled trial, N=80, 967 teeth with post-orthodontic WSL.

Outcomes: TM was more effective than neutral NaF when applied twice daily over 6 months, with greater reduction in the area of WSL and in the frequency of persisting WSL.

Author: Aykut Yetkiner et al.[9]

Year: 2013

Location: Izmir

Design: RCT, WSL reversal, N=60 children, 3 months.

Outcomes: The Streptococcus mutans counts were decreased at 3 months. TM gave a detectable remineralisation effect on WSL.

Author: Aytepe et al.[10]

Year: 2008

Location: Istanbul

Design: Cohort study, N=15 children, 56 days.

Outcomes: TM elevated saliva buffering capacity and plaque pH over 8 weeks in children with cerebral palsy.

Author: Özdas et al.[107]

Year: 2015

Location: Istanbul

Design: Experimental prospective clinical controlled trial (cerebral palsy).

Outcomes: Daily application of TM effectively changed saliva buffering capacity and plaque pH, thus promoting caries prevention in the primary and mixed dentition of cerebral palsy children.

Author: Ünlü et al.[156]

Year: 2013

Location: Konya

Design: RCT post-orthodontic WSL reversal, N=20, 36 months.

Outcomes: TM prevented WSL development during orthodontics and remineralised post-orthodontic WSL.

Author: Yazıcıoglu et al.[179]

Year: 2010

Location: Istanbul

Design: Cohort study, N=26, over 28 days.

Outcomes: TMP remineralised WSL on both smooth and occlusal surfaces.

Author: Yazıcıoglu, Ulukapı[178]

Year: 2014

Location: Istanbul

Design: Experimental in-vivo controlled trial, WSL reversal, N=42.

Outcomes: TM significantly slowed the progression of approximal lesions and promoted remineralisation.

UK

Author: Caruana et al.[27]

Year: 2009

Location: London

Design: RCT, N=15.

Outcomes: TM applied immediately before a sucrose challenge reduced plaque acid production.

Author: Garry et al.[49]

Year: 2015

Location: Liverpool

Design: Randomised cross-over in situ study, N=12 orthodontic patients, 4 weeks.

Outcomes: TM, combined with fluoride toothpaste, showed a significantly greater reduction in both WSL depth and width compared to fluoride toothpaste alone.

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Europe/North Africa

Laboratory Studies

EGYPT

Author: Elsayad, Sakr, Badr[42]

Year: 2009

Location: Cairo

Design: Molar teeth with WSL.

Outcomes: TM remineralised WSL. The remineralisation was further enhanced when F was added simultaneously.

Author: Talaat, Mahmoud[150]

Year: 2015

Location: Alexandria

Design: In vitro enamel caries model.

Outcomes: Enamel surfaces treated with TMP became more resistant to further acid attack.

GERMANY

Author: Kraft et al.[82]

Year: 2012

Location: Jena

Design: In vitro caries model.

Outcomes: Both TM and TMP gave a reduction of caries lesion depth in enamel and dentine.

Author: Willershausen, Schulz-Dobrick, Gleissner[170]

Year: 2009

Location: Mainz

Design: In vitro enamel erosion model (electron-probe microanalyser).

Outcomes: TM remineralised eroded enamel.

GREECE

Author: Rahiotis, Vougiouklakis[118]

Year: 2007

Location: Athens

Design: Dentine slabs with WSL.

Outcomes: TM treatment reduced demineralisation and enhanced remineralisation of dentine.

ITALY

Author: Ceci et al.[29]

Year: 2015

Location: Pavia

Design: In vitro erosion study (AFM).

Outcomes: TM prevented enamel erosion produced by soft drinks.

Author: Giulio et al.[50]

Year: 2009

Location: Bologna

Design: Stripped and unstripped enamel slabs with WSL.

Outcomes: TM reduced enamel demineralisation for both intact and abraded enamel surfaces.

Author: Poggio et al.[112]

Year: 2009

Location: Pavia

Design: Enamel slabs eroded by Coca Cola* (AFM).

Outcomes: TM had a protective effect on enamel demineralisation.

Author: Poggio et al.[113]

Year: 2013

Location: Pavia

Design: In vitro dentine/enamel erosion model (Coca Cola*, AFM, SEM).

Outcomes: TM was effective in preventing dentine/enamel erosion produced by a cola drink.

POLAND

Author: Mielczarek[99]

Year: 2012

Location: Warsaw

Design: WSL reversal.

Outcomes: TMP applied twice daily increased surface microhardness and longitudinal microhardness, with mineral gain to the subsurface region of the lesion.

Author: Mielczarek, Michalik[100]

Year: 2013

Location: Warsaw

Design: Enamel erosion challenge (7 day challenge using Coca-Cola*, pH 2.6; 4 cycles of 2 min. per day). TM and TMP were applied before erosive challenge.

Outcomes: TMP was effective in protecting teeth from erosion and provided an additive anti-erosion effect over a regular fluoride toothpaste.

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TURKEY

Author: Bayrak et al.[17]

Year: 2009

Location: Turkey

Design: TM applied to enamel slabs daily after bleaching, 15 days (enamel microhardness).

Outcomes: TM caused a significant increase in enamel microhardness when applied daily following bleaching.

Author: Baysal, Uysal[18]

Year: 2012

Location: Kocaeli

Design: SBS of orthodontic brackets bonded to demineralised enamel surface, TM, micro abrasion.

Outcomes: TM pre-treatment, micro abrasion of the enamel and the combination of these two treatments improved the bonding to demineralised enamel.

Author: Kargul et al.[74]

Year: 2012

Location: Istanbul

Design: Enamel slabs acid challenge.

Outcomes: A 5 minute application of TM protected enamel surfaces, made enamel resistant to subsequent acid challenge and caused recovery of surface microhardness.

Author: Kutuk, Firat, Gurgan[85]

Year: 2012

Location: Ankara

Design: Experimental enamel WSL.

Outcomes: TM was more effective at treating experimental WSL than fluoride varnish, increasing the surface microhardness of artificial early enamel lesions.

Author: Kara, Ünlü[73]

Year: 2013

Location: Konya

Design: In vitro study of the inhibition of demineralisation in enamel sections produced by Er: YAG laser and TM.

Outcomes: TM used alone or in combination with an Er:YAG laser increased the acid resistance of enamel.

Author: Tabrizi, Cakirer[148]

Year: 2011

Location: Istanbul

Design: In vitro evaluation of SBS of orthodontic brackets.

Outcomes: TM pre-treatment prior to bonding orthodontic brackets is a safe option to reduce the risk of demineralisation during fixed orthodontic treatment.

Author: Uysal et al.[157]

Year: 2011

Location: Kayseri

Design: In vitro evaluations of SBS and fracture mode of orthodontic brackets bonded to demineralised enamel.

Outcomes: TM pre-treatment was more efficient than fluoride pre-treatment for bonding orthodontic brackets.

UK

Author: Chapman, Jones, West[31]

Year: 2011

Location: Bristol

Design: Laboratory model of dental erosion using citric acid.

Outcomes: TM and TMP reduced enamel surface loss in a laboratory model of dental erosion using citric acid.

Author: Chapman, Jones, West[30]

Year: 2010

Location: Bristol

Design: Enamel slabs (profilometry).

Outcomes: TM and TMP reduced enamel surface loss from citric acid challenge.

Author: Duggal et al.[40]

Year: 2009

Location: Leeds

Design: Dentine slabs eroded with citric acid and abraded with toothbrush.

Outcomes: TM significantly reduced dentine surface loss from erosion/abrasion.

Author: Lovel, Pender, Higham[90]

Year: 2007

Location: Liverpool

Design: Enamel slabs with WSL (QLF).

Outcomes: TM was more effective than 1000 ppm F toothpaste in promoting remineralisation of WSL.

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USA/South America/Central America

Clinical Trials

BRAZIL

Author: Groisman et al.[53]

Year: 2015

Location: Rio de Janeiro

Design: WSL reversal, N=12 orthodontic patients, TMP applied for 4 weeks.

Outcomes: TMP remineralised WSL in orthodontic patients. At a12-month follow-up, TMP protective effect was noticed as WSL did not progress.

MEXICO

Author: Juárez-López et al.[69]

Year: 2014

Location: Zaragoza

Design: Quasi-experimental study, N=104 six year old children, TMP biweekly applications at school for 6 months (DIAGNOdent).

Outcomes: TMP protected and remineralised incipient carious lesions, compared to sodium fluoride gel applications.

USA

Author: Robertson et al.[128]

Year: 2011

Location: Houston

Design: RCT, N=50, over 12 weeks.

Outcomes: TMP prevented WSL development during orthodontics, and reduced the number of existing WSL. Patients using the placebo paste showed an increased number of WSL.

Author: Sheharyar et al.[139]

Year: 2007

Location: Iowa

Design: RCT, N=45, over 2 weeks.

Outcomes: TM significantly reduced bleaching sensitivity and produced a greater, although not significant, shade change.

Laboratory Studies

ARGENTINA

Author: Rodriguez et al.[129]

Year: 2011

Location: Córdoba

Design: Enamel with post-orthodontic WSL.

Outcomes: TM and TMP gave mineral gain in the subsurface region up to 230 microns, as well as surface mineral deposition.

BRAZIL

Author: Aguiar et al.[4]

Year: 2011

Location: São Paulo

Design: TM effect when applied to enamel prior to adhesive procedures.

Outcomes: Application of TM before adhesive systems increased bond strength to enamel.

Author: Borges et al.[20]

Year: 2011

Location: Pernambuco

Design: In vitro bleaching efficacy and TM (microhardness of bleached enamel), 14 days.

Outcomes: The use of TM with 10% or 16% carbamide peroxide bleaching agents increased the bleached enamel microhardness and did not have an influence on whitening efficacy.

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Author: Borges et al.[22]

Year: 2013

Location: Campinas

Design: In vitro bonding/sealant evaluation.

Outcomes: Applying TM on enamel before adhesive systems increased bond durability of the tested sealant.

Author: Carvalho et al.[28]

Year: 2012

Location: Paraiba

Design: In vitro enamel erosion model.

Outcomes: TMP prevented enamel erosion from repeated challenges using a cola soft drink over 7 days, when applied immediately following each erosive challenge.

Author: Gomes et al.[51]

Year: 2010

Location: São Paulo

Design: De-proteinated enamel.

Outcomes: TM applied after in-office bleaching helped to restore the glossy nature of the enamel surface.

Author: Lago et al.[86]

Year: 2012a

Location: São Paulo

Design: TM application on enamel slabs prior to tooth whitening.

Outcomes: TM did not affect the colour change caused by the bleaching procedure, but prevented the reduction in surface microhardness caused by the hydrogen peroxide bleaching gel.

Author: Lago et al.[87]

Year: 2012b

Location: São Paulo

Design: TM application on enamel slabs prior to tooth whitening.

Outcomes: TM prevented the reduction of enamel surface microhardness caused by exposure to 35% hydrogen peroxide during in-office bleaching, with full recovery of enamel microhardness after 7 days storage in artificial saliva.

Author: Publio et al.[116]

Year: 2012

Location: São Paulo

Design: TM application on enamel blocks after tooth whitening and prior to exposure to cigarette smoke.

Outcomes: Treatment of bleached enamel with neutral fluoride increased staining of the enamel due to cigarette smoke, while treatment with TMP did not.

Author: Souza e Silva et al.[142]

Year: 2012

Location: São Paulo

Design: Dentine eroded with Coca-Cola* (pH 2.6) for 90 sec, 4 times a day. TM and TMP applied after erosive challenge.

Outcomes: TM and TMP applied to dentine protected the surface when challenged with Coca Cola* (pH 2.6) four times per day. Both significantly reduced dentine surface loss compared with a placebo paste.

Author: Turssi et al.[155]

Year: 2008

Location: São Paulo

Design: Enamel slabs with erosion lesions (microhardness).

Outcomes: Treatment of eroded enamel with TMP reduced progression of erosion compared with the untreated control.

USA

Author: Augustson, Tantbirojn, Versluis[8]

Year: 2010

Location: Minneapolis

Design: Enamel eroded with Hydrochloric acid (HCl) (microhardness).

Outcomes: After HCl erosion, 60 minutes exposure to TMP or TM (but not 3000 ppm F rinse) increased the enamel hardness. Greater recovery was seen with TMP than with TM.

Author: Behnan et al.[19]

Year: 2009

Location: Ann Arbor

Design: Enamel slabs (QLF).

Outcomes: TM prevented enamel demineralisation around orthodontic brackets during an in vitro acid challenge.

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USA/South America/Central America

Laboratory Studies (cont.)

USA (cont.)

Author: Connor, Banfield, Vandewalle[36]

Year: 2014

Location: Lackland

Design: In vitro study to assess the effect of various surface treatments on the antimicrobial activity of desiccated glass-ionomer (GI) and resin-modified glass-ionomer (RMGI) materials.

Outcomes: TM suppressed the growth of Streptococcus mutans on desiccated GI and RMGI materials.

Author: Connor et al.[37]

Year: 2014

Location: Indianapolis

Design: In vitro model testing the effect of various surface treatments on the mechanical properties of desiccated and RMGI materials.

Outcomes: Exposure for 1 week to TM did not adversely affect the physical properties of desiccated GI and RMGI materials.

Author: Dehghan et al.[38]

Year: 2012

Location: Memphis

Design: In vitro enamel erosion model.

Outcomes: Both TM and TMP increased the hardness of enamel that had been softened by exposure to HCl for 10 minutes, which mimicked regurgitated stomach acid. TMP restored the enamel surface microhardness within one hour to the baseline value. Hardness recovery of enamel was minimal with saliva alone.

Author: Flaitz, Hicks, Garcia-Godoy[46]

Year: 2013

Location: Memphis

Design: In vitro enamel and root caries formation model.

Outcomes: TMP provided the greatest reduction in lesion depths for enamel and root surface caries, compared to no treatment, theobromine toothpaste and conventional fluoride toothpaste.

Author: Garcia-Godoy et al.[48]

Year: 2009

Location: Fort Lauderdale

Design: Root segments were exposed to a demineralising solution (PLM).

Outcomes: TM and TMP protected root surfaces from an artificial caries challenge. TMP enhanced caries resistance of root surfaces.

Author: Hicks, Flaitz[60]

Year: 2014

Location: Houston

Design: In vitro root surface caries model.

Outcomes: TMP significantly improved root surface caries resistance and provided a greater degree of caries prevention than 5000 ppm fluoride pastes (Colgate Prevident*, 3M Espe Clinpro 5000*).

Author: Hicks, Flaitz[64]

Year: 2013

Location: Houston

Design: In vitro enamel caries model.

Outcomes: TMP significantly reduced caries lesion depths, compared with fluoride varnish containing tri-calcium phosphate.

Author: Hicks, Flaitz[59]

Year: 2011

Location: Houston

Design: In vitro caries model.

Outcomes: TMP provided protection against root surface caries in an in vitro caries model, with lower mean lesion depths versus controls.

Key **F** Fluoride **QLF** Quantitative Light Fluorescence **PLM** Polarising Light Microscopy **RCT** Randomised Controlled Trial **WSL** White Spot Lesions **GI** Glass-ionomer **CPP-ACP** Casein Phosphopeptide-Amorphous Calcium Phosphate **SBS** Shear Bond Strength **HCl** Hydrochloric acid **TCP** Functionalised tri-Calcium Phosphate

Author: Hicks, Flaitz[63]

Year: 2010

Location: Houston

Design: In vitro, enamel slabs were exposed to a demineralising solution (PLM).

Outcomes: TMP reduced caries lesion depths as effectively as a 5000 ppm F toothpaste, despite having a fluoride content of only 900 ppm F.

Author: Hicks[62]

Year: 2006

Location: Houston

Design: Enamel slabs were exposed to a demineralising solution.

Outcomes: TMP enhanced the resistance of enamel surfaces to in vitro caries formation compared with TM or fluoride alone.

Author: Hicks, Flaitz[61]

Year: 2005

Location: Houston

Design: Root segments were exposed to a demineralising solution (PLM).

Outcomes: TM enhanced the resistance of root surfaces to artificial caries formation, when compared with fluoride rinse (0.05% NaF).

Author: Huang, Tantbirojn[65]

Year: 2008

Location: Minneapolis

Design: Enamel slabs eroded with Coke®*.

Outcomes: TM treatment improved enamel hardness more than artificial saliva.

Author: Kao et al.[72]

Year: 2008

Location: West Virginia

Design: Enamel slabs were exposed to a demineralising solution.

Outcomes: TM treatment increases acid resistance of enamel when exposed to a demineralising solution.

Author: Setien et al.[138]

Year: 2008

Location: Dallas

Design: Enamel slabs with WSL (microhardness).

Outcomes: TM treatment increased the microhardness of demineralised enamel.

Author: Tantbirojn et al.[151]

Year: 2008

Location: Minnesota

Design: In vitro erosion challenge (cola drink for 8 min).

Outcomes: TM increased hardness of enamel softened by a cola drink.

Author: Trajtenberg, Flaitz, Hicks[154]

Year: 2007

Location: Houston

Design: Root segments were exposed to a demineralising solution (PLM).

Outcomes: TM treatment improved caries resistance of root surfaces.

Author: Westerman, Flaitz, Hicks[169]

Year: 2014

Location: Omaha and Houston

Design: In vitro root surface caries challenge.

Outcomes: TMP significantly reduced the effects of an in vitro root surface caries challenge, and was more effective than fluoride rinses.

Author: Westerman et al.[168]

Year: 2009

Location: Houston

Design: Root surfaces caries model.

Outcomes: TM, in combination with argon laser treatment, enhanced caries resistance of root surfaces.

Author: Xie, Wu, Bedran-Russo[181]

Year: 2007

Location: Chicago

Design: Root segments were exposed to a demineralising solution (microhardness).

Outcomes: TMP treatment significantly increased the hardness of root dentine.

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Asia

Clinical Trials

CHINA

Author: Duan et al.[39]

Year: 2009

Location: Wuhan

Design: RCT, N=30 subjects, 14 days.

Outcomes: TM reduced sensitivity with equal effectiveness to potassium nitrate gel.

Author: Mahesuti et al.[91]

Year: 2014

Location: Wuhan

Design: Experimental controlled trial (treatment of dentine hypersensitivity), N=102, 2 months.

Outcomes: A sustained clinical reduction in dentine hypersensitivity was observed with TM.

Author: Zhou,Sun, Zhu[184]

Year: 2009

Location: Changchun

Design: Cohort study, N=10 subjects, 2 months.

Outcomes: TMP reduced visible enamel demineralisation and improved the appearance of long-standing post-orthodontic WSL.

Author: Wang, Yan, Wang[166]

Year: 2012

Location: Beijing

Design: Single-blind clinical study (N=20 orthodontic patients with WSL, TM applied every night after tooth-brushing; 6 months).

Outcomes: TMP remineralised existing WSL.

INDIA

Author: Grewal, Kudupudi, Grewal[52]

Year: 2013

Location: Amritsar

Design: In situ clinical trial.

Outcomes: TM promoted significant remineralisation of enamel eroded by cola drinks as revealed by significant morphological changes seen in SEM magnification and spectrophotometric analyses.

Author: Gugnani, Gupta, Pandit[54]

Year: 2008

Location: India

Design: RCT, N=48, 28 days.

Outcomes: A single application of TM provided short term reduction in dentine hypersensitivity.

Author: Krithikadatta et al.[83]

Year: 2013

Location: Chennai

Design: RCT, N=45, 30 days.

Outcomes: TM and TMP showed greater remineralising effect of WSL than NaF mouthrinse.

Author: Subramaniam, Naidu[144]

Year: 2009

Location: Bangalore

Design: RCT, N=30 subjects, 16 days.

Outcomes: TMP (79.5%) and Cervitec Gel* (51.6%) produced a significant reduction in levels of Streptococcus mutans.

Author: Srinivasan, Kavitha, Longanathan[143]

Year: 2010

Location: Chennai

Design: In situ study, N=5.

Outcomes: As measured by microhardness values, both TM (+46%) and TMP (+64%) substantially remineralised eroded enamel compared to a saliva control (+3%).

Author: Vashisht et al.[159]

Year: 2010

Location: Chennai

Design: Experimental ex-vivo controlled trial (early enamel lesions), N=10, TM was applied twice a day for 14 days.

Outcomes: TM remineralised early enamel lesions.

Author: Vashisht et al.[160]

Year: 2013

Location: Punjab

Design: RCT (WSL reversal), N=60, 3 months.

Outcomes: TM remineralised white spots better than the fluoride control.

IRAN

Author: Banava, Houshyari, Safaie[12]

Year: 2015

Location: Tehran

Design: RCT, N=20, TM applied twice daily, 6 weeks.

Key **F** Fluoride **QLF** Quantitative Light Fluorescence **PLM** Polarising Light Microscopy **RCT** Randomised Controlled Trial **WSL** White Spot Lesions **GI** Glass-ionomer **CPP-ACP** Casein Phosphopeptide-Amorphous Calcium Phosphate **SBS** Shear Bond Strength **HCl** Hydrochloric acid **TCP** Functionalised tri-Calcium Phosphate

Outcomes: Twice daily applications of TMP improved resting and stimulated salivary rates as well as saliva's buffering capacity in patients undergoing chemotherapy.

Author: Heshmat, Abdian, Faraji[57]

Year: 2013

Location: Tehran

Design: In a clinical study with 40 subjects, plaque acidity (pH) at distal of first molar was evaluated before and 10 minutes after 10% sucrose consumption. In the next step, TM and TMP pastes were used as directed on tooth surface. Plaque pH was assessed 30 and 60 minutes, 24, 48, 72 and 96 hours after application.

Outcomes: TM and TMP both elevated plaque pH levels for the first 48 hours. The pattern differed after this period, with TMP giving elevated pH until 96 hours.

Author: Heshmat et al.[58]

Year: 2014

Location: Tehran

Design: Triple-blind, cross-over randomised trial (N= 30 orthodontic patients, TMP applied nightly, 12 weeks).

Outcomes: TMP significantly increased plaque pH when compared to a placebo. TMP neutralised plaque pH accumulated around fixed orthodontic appliances.

Author: Memarpour et al.[98]

Year: 2015

Location: Shiraz

Design: RCT, N=140 children aged 12-36 months, WSL reversal, 12 months.

Outcomes: Twice daily application of TM was effective in stopping and reversing WSL in young children.

JAPAN

Author: Katsura et al.[77]

Year: 2010

Location: Nigata

Design: RCT, N=19, 6 months.

Outcomes: TM recalcified root surfaces in patients with radiation induced xerostomia. TM combined with fluoride was superior to fluoride alone.

Author: Kitasako et al.[80]

Year: 2009

Location: Tokyo

Design: Cohort study, N=7 subjects, 6 months.

Outcomes: TM produced remineralisation of WSL over 6 months, and increased the surface pH of the lesions (using a micro sensor).

Author: Sakaguchi et al.[134]

Year: 2006

Location: Tokyo

Design: In situ study, N=5 subjects, 7 days.

Outcomes: TM gave greater remineralisation than 950 ppm fluoride toothpaste, and even greater remineralisation was achieved with TMP, indicating synergy of fluoride with CPP-ACP.

MALAYSIA

Author: Venkiteswaran, Awang, Rahim[161]

Year: 2009

Location: Kuala Lumpur

Design: Cross-over design with 3 groups, N=40, 5 days.

Outcomes: TM and TMP increased saliva buffering capacity and salivary concentration of calcium and phosphate ions.

THAILAND

Author: Amornpipithkul, Sanguansin, Leelataweewud[7]

Year: 2009

Location: Bangkok

Design: Cohort study, N=21 children, 14 days.

Outcomes: Daily application of TM increased plaque calcium and inorganic phosphate levels in a time-dependent manner.

Author: Thepyou et al.[153]

Year: 2013

Location: Bangkok

Design: Randomised, cross-over, double blind in situ trial (N=6; TM applications twice a day; 4 weeks).

Outcomes: TM promoted sub-surface enamel remineralisation..

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Asia

Laboratory Studies

CHINA

Author: Cao et al.[25]

Year: 2013

Location: Hong Kong

Design: In vitro dentine slabs exposed to phosphoric acid and sodium trimetaphosphate. TM and a remineralising solution were used for 10 days.

Outcomes: TM induced the biomimetic mineralisation of dentine through apatite formation along and between the phosphorylated dentine collagen fibers.

Author: Kumar, Itthagarun, King[84]

Year: 2008

Location: Hong Kong

Design: Enamel slabs with WSL.

Outcomes: TM remineralised WSL and showed a higher remineralising potential when applied after application of a fluoride toothpaste.

Author: Wang et al.[167]

Year: 2014

Location: Chengdu

Design: In vitro erosion model using Coca Cola* (pH = 2.7) (AFM, XRD).

Outcomes: TM protected teeth against cola drink erosion.

Author: Wu, Liu, Hou[173]

Year: 2010

Location: China

Design: Enamel with WSL (polarised images).

Outcomes: TM remineralised WSL and was even more effective when used in conjunction with F toothpaste.

Author: Xiaojun et al.[180]

Year: 2009

Location: Shanghai

Design: In vitro orthodontic bracket bonding (SBS enamel).

Outcomes: Application of TM prior to orthodontic bracket bonding significantly increased SBS of orthodontic brackets and did not compromise brackets bond strength.

Author: Zhang et al.[182]

Year: 2011

Location: Chengdu

Design: In vitro caries model (enamel microhardness).

Outcomes: TM was effective in remineralising early enamel lesions of the primary teeth. Enamel treated with TM had mineral crystals with a more regular shape (crystals were better organised), with less porosity and fewer interprismatic spaces than enamel treated with 500 ppm NaF. TM increased the enamel surface microhardness near baseline levels.

Author: Zhao, Cai[183]

Year: 2001

Location: Guangdong

Design: In vitro caries model.

Outcomes: TMP remineralised WSL in vitro. The remineralising rates were increased with the experiment time (within 10 days).

Author: Zhou et al.[185]

Year: 2014

Location: Beijing

Design: In vitro caries model (AFM).

Outcomes: TM repaired the microstructure of enamel, including prism and interprismatic spaces, through significantly increased hydroxyapatite crystal size and Ca/P molar ratios compared to 500 ppm NaF.

Key **F** Fluoride **QLF** Quantitative Light Fluorescence **PLM** Polarising Light Microscopy **RCT** Randomised Controlled Trial **WSL** White Spot Lesions **GI** Glass-ionomer **CPP-ACP** Casein Phosphopeptide-Amorphous Calcium Phosphate **SBS** Shear Bond Strength **HCl** Hydrochloric acid **TCP** Functionalised tri-Calcium Phosphate

INDIA

Author: Agrawal et al.[3]

Year: 2014

Location: Madhya Pradesh

Design: In vitro artificial erosion model (primary and permanent teeth, surface microhardness).

Outcomes: TM was more effective at preventing dental erosion than 1.23 % APF gel and iron supplement.

Author: Duraisamy et al.[41]

Year: 2015

Location: Salem

Design: In vitro evaluation of demineralisation (artificial caries challenge for 10 days).

Outcome: TMP was superior in inhibiting enamel demineralisation compared to fluoride varnish or TM alone.

Author: Hegde, Moany[56]

Year: 2012

Location: Karnataka

Design: Enamel slabs were exposed to a demineralising solution and treated with TM twice daily for 14, 21, 28 and 35 days.

Outcomes: TM significantly remineralised the artificial enamel subsurface lesions. The remineralisation achieved was dose-dependent (increased number of days of TM treatment, increased remineralisation rate was observed).

Author: Jayarajan et al.[68]

Year: 2011

Location: Tamil Nadu

Design: Tooth slabs were exposed to demineralisation solution.

Outcomes: TMP showed marginally more amount of remineralisation than TM.

Author: Mathias, Kavitha, Mahalaxmi[95]

Year: 2009

Location: Chennai

Design: In vitro micro abrasion with and without TM treatment (surface roughness of enamel).

Outcomes: Application of TM after micro abrasion procedure significantly reduces enamel surface roughness, thereby decreasing the risk of caries.

IRAN

Author: Banava et al.[13]

Year: 2011

Location: Tehran

Design: In vitro caries model (microhardness).

Outcomes: TM applications twice a day for 4 weeks resulted in higher resistance of enamel to demineralisation compared to a fluoride varnish application.

Author: Khoroushi, Mazaheri, Manoochehri[79]

Year: 2011

Location: Iran

Design: TM application on bovine teeth blocks between exposures to 38% or 9.5% hydrogen peroxide gel.

Outcomes: TM applications increased the flexural strength of bleached teeth.

Author: Memarpour, Soltanimehr, Sattarahmady[97]

Year: 2015

Location: Shiraz

Design: Enamel slabs (primary teeth) exposed to erosive challenge (enamel microhardness).

Outcomes: The efficacy of TM for remineralising eroded enamel was greater than fluoride toothpaste, fluoride varnish or TCP varnish.

Author: Yassaei et al.[177]

Year: 2014

Location: Yazd

Design: In vitro study of the inhibition of demineralisation in enamel sections produced by Er: YAG laser and TM.

Outcomes: TM used alone or in combination with an Er:YAG laser increased the acid resistance of enamel.

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Asia

Laboratory Studies (cont.)

JAPAN

Author: Hamba et al.[55]

Year: 2011

Location: Tokyo

Design: In vitro artificial caries challenge for 24h, 72h and 120h (polychromatic micro-CT).

Outcomes: The application of TM or TMP to sound enamel surfaces resulted in inhibition of enamel demineralisation; a higher acid resistance effect was noted for TMP.

Author: Imamura et al.[66]

Year: 2012

Location: Tokyo

Design: In vitro model of extrinsic tooth staining after in-office bleaching.

Outcomes: TM and TMP prevented staining of freshly bleached enamel by black tea.

Author: Ogata et al.[104]

Year: 2010

Location: Tokyo

Design: Enamel slabs with WSL.

Outcomes: A combination of TM and NaF was superior to F alone for prevention of demineralisation and for remineralisation of WSL.

Author: Oshiro et al.[106]

Year: 2007

Location: Tokyo

Design: Enamel and dentine slabs were exposed to 0.1M lactic acid buffer solution.

Outcomes: TM was effective in preventing demineralisation of enamel and dentine.

Author: Kariya et al.[75]

Year: 2004

Location: Tokyo

Design: Enamel slabs were exposed to a demineralising solution.

Outcomes: TMP reduced enamel mineral loss compared with TM. Acid resistance of remineralised lesions was greater for TMP compared with TM.

Author: Sakaguchi et al.[133]

Year: 2005

Location: Tokyo

Design: Enamel slabs were exposed to a demineralising solution (QLF).

Outcomes: TM preserved the inorganic component of enamel by preventing demineralisation.

Author: Sato et al.[136]

Year: 2011

Location: Tokyo

Design: In vitro study of biofilm interaction with CPP-ACP.

Outcomes: Biofilms of Streptococcus mutans bind to CPP-ACP and serve as a reservoir for calcium and phosphate ions. Of the commercial products tested, only CPP-ACP based products gave high levels of water soluble calcium phosphate.

Author: Sato, Yamanaka, Yoshii[135]

Year: 2003

Location: Tokyo

Design: Enamel slabs were exposed to a demineralising solution (microhardness).

Outcomes: TM buffered acids produced by Streptococcus mutans. TM reduced enamel demineralisation from acidic gel and Streptococcus mutans fermentation.

Author: Takamizawa et al.[149]

Year: 2005

Location: Tokyo

Design: Enamel slabs were exposed to a demineralising solution (ultrasound).

Outcomes: TM preserved the inorganic component of enamel by preventing demineralisation.

Author: Yamaguchi et al.[174]

Year: 2006

Location: Tokyo

Design: Enamel slabs were exposed to a demineralising solution (ultrasound).

Outcomes: TM preserved the inorganic component of enamel by preventing demineralisation.

Author: Yamaguchi et al.[175]

Year: 2007

Location: Tokyo

Design: Dentine slabs were treated with TM and then exposed to demineralising solution.

Outcomes: TM prevented demineralisation of dentine.

Key **F** Fluoride **QLF** Quantitative Light Fluorescence **PLM** Polarising Light Microscopy **RCT** Randomised Controlled Trial **WSL** White Spot Lesions **GI** Glass-ionomer **CPP-ACP** Casein Phosphopeptide-Amorphous Calcium Phosphate **SBS** Shear Bond Strength **HCl** Hydrochloric acid **TCP** Functionalised tri-Calcium Phosphate

Author: Yasuda et al.[176]

Year: 2010

Location: Tokyo

Design: In vitro caries model.

Outcomes: TMP prevented demineralisation and retained enamel surface layer. TMP contained significantly higher bio-available calcium and phosphate ions than Clinpro 5000* and Clinpro C950*.

SOUTH KOREA

Author: Kim et al.[78]

Year: 2007

Location: South Korea

Design: In vitro, enamel slabs with WSL (microhardness).

Outcomes: TMP was more effective than TM alone or 3000 ppm F solution in preventing demineralisation.

Author: Oh et al.[105]

Year: 2014

Location: Anyang

Design: In vitro model assessing the colour and surface hardness of bovine teeth after bleaching treatments, subsequent to the application of TM or various fluoride varnishes.

Outcomes: Both TM and varnishes applied before bleaching did not reduce the effectiveness of bleaching, and led to increased surface hardness.

THAILAND

Author: Juntavee et al.[70]

Year: 2011

Location: Khon-Kaen

Design: In vitro WSL reversal.

Outcomes: TM remineralised enamel white spot lesions.

Author: Kallayathi, Panich, Poolthong[71]

Year: 2008

Location: Bangkok

Design: Enamel slabs (microhardness).

Outcomes: TM treatment protected enamel from softening from cola drink exposure.

Author: Panich, Thanyakoop[109]

Year: 2011

Location: Khon-Kaen

Design: Effect of TM treatment on the microtensile bond strength of 4 adhesive systems to enamel.

Outcomes: Application of TM to enamel improved the micro-tensile bond strength for Optibond all-in-one*. It did not affect the microtensile bond strength for Optibond FL*, Clearfil SE bond*, and Adper Single Bond 2*.

Author: Panich, Poolthong[108]

Year: 2009

Location: Bangkok

Design: Enamel slabs, eroded with cola.

Outcomes: TM significantly increased the hardness of eroded enamel.

Author: Sukasaem, Panich, Poolthong[146]

Year: 2006

Location: Bangkok

Design: In vitro erosion model (cola drink).

Outcomes: TM increased hardness of enamel eroded by cola-drink. The remineralisation effect of TM was significantly higher than that of artificial saliva.

Author: Theerapiboon, Puanaiyaka, Maneenut[152]

Year: 2008

Location: Bangkok

Design: Enamel slabs with WSL (PLM).

Outcomes: TM treatment remineralised and reduced the volume of WSL in both permanent and deciduous enamel.

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Australia/New Zealand

Clinical Trials

AUSTRALIA

Author: Bailey et al.[11]

Year: 2009

Location: Melbourne

Design: RCT, N=45 subjects (post-orthodontic WSL reversal), 12 weeks.

Outcomes: TM,applied twice daily for 12 weeks, produced more regression of post-orthodontic WSL than the placebo crème.

Author: Manton et al.[92]

Year: 2006

Location: Melbourne

Design: RCT, in situ model, N=6, over 10 days.

Outcomes: TM produced 551% more remineralisation of enamel WSL than the placebo crème.

Author: Pukallus et al.[117]

Year: 2013

Location: Brisbane

Design: RCT, N=345 infants, 2 years.

Outcomes: Daily application of TM, from the time of tooth eruption until approximately 24 months old, has the greater ability, compared to chlorhexidine, to reduce Streptococus mutans presence in children who had these bacteria detected at early stages.

Author: Shen et al.[140]

Year: 2011

Location: Melbourne

Design: RCT, in situ model, N=6, over 10 days.

Outcomes: Only TM and TMP significantly increased salivary calcium and phosphate levels. TM and TMP were superior to 5000 ppm F toothpaste. TMP produced the highest level of enamel lesion remineralisation. Clinpro* was not significantly different to 1000 ppm F toothpaste.

Author: Tabatabaee, Walsh[147]

Year: 2015

Location: Brisbane

Design: RCT, N=60, 4 weeks.

Outcomes: TMP reduced plaque area, plaque maturity and plaque acid production on maxillary anterior teeth, compared to both a fluoride placebo paste which was identical but lacking CPP-ACP, and a no-treatment control.

Author: Vlacic[162]

Year: 2007

Location: Brisbane

Design: RCT, N=12, over 12 months.

Outcomes: TM caused a progressive reduction in sensitivity to air stimulation, and also improved stimulated salivary flow and pH.

Author: Walsh et al.[165]

Year: 2010

Location: Brisbane

Design: RCT, N=36 subjects, over 56 days, versus potassium nitrate toothpaste.

Outcomes: TM reduced sensitivity to air, osmotic, thermal and tactile stimuli, with equal effectiveness to potassium nitrate toothpaste.

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Laboratory Studies

AUSTRALIA

Author: Adebayo, Burrow, Tyas[1]

Year: 2008

Location: Melbourne

Design: Dentine slabs Microshear Bond Strength (MSBS), Clearfil SE Bond*, G-Bond.

Outcomes: TM treatment did not affect the MSBS of both the 2-step and the all-in-one adhesive to dentine, when the smear layer was retained before treatment. Removal of the smear layer before treatment resulted in higher MSBS on deep dentine for the 2-step self-etching adhesive, and a lower MSBS on superficial dentine for the all-in-one adhesive.

Author: Adebayo, Burrow, Tyas[2]

Year: 2009

Location: Melbourne

Design: Enamel slabs.

Outcomes: Treatment with TM did not inhibit phosphoric acid etching of enamel. Resin infiltration into enamel was unaffected. Enamel etching/ conditioning improved bonding efficiency of a self-etching primer adhesive, after TM application.

Author: Alkhtib et al.[6]

Year: 2013

Location: Melbourne

Design: In vitro bleaching (enamel hardness).

Outcomes: Application of TM after bleaching was able to re-establish the baseline enamel hardness and reduced modulus, decreasing the adverse effects of bleaching enamel.

Author: Cai et al.[24]

Year: 2009

Location: Melbourne

Design: Analysis of available Calcium, Phosphate and Fluoride ions.

Outcomes: Compared to other calcium/phosphate containing products, TMP has significantly more bio-available Calcium, Phosphate and Fluoride ions.

Author: Crombie et al.[32]

Year: 2013

Location: Melbourne

Design: In vitro post-eruptive 'maturation' of MIH-affected enamel, TM, 14 days.

Outcomes: TM applications increased mineral content and reduced porosity of developmentally hypomineralised enamel.

Author: Manton et al.[94]

Year: 2008

Location: Melbourne

Design: Enamel stained with tea.

Outcomes: TM used with carbamide peroxide did not affect bleaching effectiveness and enhanced aesthetics by increasing lustre and translucency.

Author: Manton et al.[93]

Year: 2006

Location: Melbourne

Design: Enamel slabs with WSL.

Outcomes: TM caused more remineralisation of white spot lesions than human saliva.

Author: Mayne et al.[96]

Year: 2011

Location: Melbourne

Design: Enamel slabs with WSL and orthodontic brackets.

Outcomes: TMP produced high percentages of remineralisation of WSL, which reduced the extent of enamel damage caused by bracket removal subsequently.

Author: Piekarz et al.[111]

Year: 2008

Location: Adelaide

Design: In vitro demineralisation cycles (1500 one-minute exposure (cycles) to white wine (pH = 3.5); TM was applied every 20 cycles.

Outcomes: TM reduced wine erosion in both enamel and dentine/cementum.

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Australia/New Zealand

Laboratory Studies (cont.)

Author: Ranjitkar et al.[122]

Year: 2009

Location: Adelaide

Design: Enamel and dentine, eroded with citric acid and abraded with toothbrush.

Outcomes: TM significantly reduced enamel and dentine wear compared to placebo paste and control.

Author: Ranjitkar et al.[123]

Year: 2009

Location: Adelaide

Design: Enamel slabs, severe erosion under load.

Outcomes: TM wear reduction was significantly better than placebo paste (TM minus CPP-ACP), which was significantly better than the control.

Author: Ranjitkar et al.[124]

Year: 2009

Location: Adelaide

Design: In vitro erosion model (dentine wear rate, HCl, pH 3.0, TM).

Outcomes: Dentine wear was reduced significantly with continuous application of TM.

Author: Sudjalim et al.[145]

Year: 2007

Location: Melbourne

Design: Extracted teeth were exposed to a demineralising solution (QLF).

Outcomes: TMP was better at reducing mineral loss around orthodontic brackets than TM or fluoride alone.

Author: Wong et al.[171]

Year: 2010

Location: Melbourne

Design: Analyses of H_2O_2 levels in the pulp chambers of teeth treated with and without TM prior to bleaching.

Outcomes: A 2 week application of TM, prior to the use of an in-office bleaching gel, did not adversely affect the bleaching effectiveness, but reduced the levels of hydrogen peroxide entering the pulp chamber.

NEW ZEALAND

Author: Batra et al.[16]

Year: 2011

Location: Dunedin, New Zealand

Design: In vitro MIH enamel slabs treated with 1.5% sodium hypochlorite and TM.

Outcomes: Application of TM improved the mechanical properties of enamel affected by MIH.

Key **F** Fluoride **QLF** Quantitative Light Fluorescence **PLM** Polarising Light Microscopy **RCT** Randomised Controlled Trial **WSL** White Spot Lesions **GI** Glass-ionomer **CPP-ACP** Casein Phosphopeptide-Amorphous Calcium Phosphate **SBS** Shear Bond Strength **HCl** Hydrochloric acid **TCP** Functionalised tri-Calcium Phosphate



* Not trademarks of GC Corporation

Key **AFM** Atomic Force Microscopy **RMGI** Resin-modified Glass-ionomer **MIH** Molar Incisor Hypomineralisation **TM** GC Tooth Mousse
NaF Sodium Fluoride **APF** Acidulated Phosphate Fluoride **XRD** X-ray Diffraction **MSBS** Microshear Bond Strength **TMP** GC Tooth Mousse Plus

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Mint, Pack of 10 pcs
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