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Solvent-induced Expansion of Dried-demineralized Dentin Matrix. D.H. PASHLEY, K.A. AGEE*, M. NAKAJIMA, F.R. TAY, R.M. CARVALHO, F.J. HARMON (Medical College of Georgia, Augusta, Georgia).

The purpose of this study was to test the hypothesis that the degree of re-expansion of dried demineralized dentin matrix is proportional to the ability of polar solvents to compete with interpeptide weak forces within the matrix. Dentin discs about 0.2 mm thick were prepared from mid-coronal dentin of extracted human third molars. After demineralization in 0.5M EDTA, the specimens were placed in an LVDT device to measure changes in matrix height. Dry matrices were created by blowing dry N_2 gas on the specimens. Then one of the following neat solvents was applied and the degree of re-expansion followed. Methanol (M), ethanol (E), n-propanol (P), n-butanol (B), formamide (F), ethylene glycol (EG), or HEMA were added. Groups identified by different superscript letters are significantly different ($p<0.05$), ANOVA & Tukey's. The results ($\bar{x}$ ± S.D. expansion expressed as % of water value) were:

Solvents	M	E	P	B	F	EG	HEMA
$\bar{x}$ %expansion	84[a]	63[a]	19[b]	19[b]	89[a]	110[a]	11[b]
± S.D. (N=10)	15	14	22	15	16	9	21

The results indicate that water, methanol, ethanol, formamide and ethylene glycol can break the weak forces within the matrix, while larger alcohols (P and B) and HEMA were ineffective. When the solvents were ranked by Hansen's solubility parameter for H-bonding force (δ_h), regression analysis produced a high correlation (R^2=0.79) between re-expansion and δ_h. Supported, in part, by grant DE06427, from the NIDCR.

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Novel Tris-methacrylate Monomoer for Dental Resins. F. GAO*, S. R. SCHRICKER, Y. Tong, Y. Huang, B. M. CULBERTSON (College of Dentistry, The Ohio State University, Columbus, OH).

A new tris-methacrylate monomer 1,1,1-tris-[4-(methacryloxyethyloxy)phenyl] ethane [TMEPE] has been synthesized in quantitative yield. This new monomer has a low viscosity of 11.55 Pa.S at 25°C, and it was mixed with triethyleneglycol dimethacrylate [TEGDMA] and evaluated as a neat dental composite resin. The BisGMA/TEGDMA resins having the similar composition ratio are used as comparisons. The solution viscosity before VLC, polymerization shrinkage, compressive strength (CS), flexural strength (FS), and Vickers hardness were measured. The results **show TMEPE/TEGDMA combination has advantages over BisGMA/TEGDMA blend by significantly reducing the solution viscosity.** Lower solution viscosity could allow for higher fillers loading which will improve the properties at the composite and offset the small increase in resin shrinkage.

Sample	Viscosity (Poise)	Shrinkage (%)	CS (MPa)	Modulus (GPa)	FS (MPa)	Hardness
[a]BisGMA/TEGDMA	0.50(0.11)	10.37(0.55)	376(16)	2.46(0.44)	72.6(3.8)	104(5)
[a]TMEPE/TEGDMA	0.17(0.03)	12.4(0.61)	399(23)	2.71(0.38)	88.4(4.8)	128(5)
[b]BisGMA/TEGDMA	7.29(0.93)	7.58(0.39)	427(33)	3.24(0.25)	105.3(4.4)	>140
[b]TMEPE/TEGDMA	2.16(0.34)	8.72(0.44)	496(51)	3.45(0.22)	97.2(5.8)	>140

[a] and [b] samples: the weight ratio of two component are 50/50 and 70/30, respectively. Entries are mean values for six specimen with standard deviations in parentheses.

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Influence of Hyperbranched Multi-methacrylates on Human Gingival Fibroblast Proliferation, Q. WAN*, D. RUMPF, S. R. SCHRICKER, A. MARIOTTI, AND B. M. CULBERTSON (Ohio State Univ., Columbus, OH 43218)

We have previously shown that hyperbranched multi-methacrylate (H-MMA) modified dental resins have VLC activities, lower polymerization shrinkage, and improved mechanical properties, compared to the BisGMA/TEGDMA neat resin. The purpose of this study was to evaluate the biocompatibility of H-MMA modified dental neat resins. The cell proliferation of five human gingival fibroblast strains on either H-MMA, BisGMA/TEGDMA or polystyrene disk was examined. Following 10 days of cell proliferation, there was no statistical difference in cell number between H-MMA modified and unmodified resin disks; however, cell number on polystyrene control disks was statistically higher when compared to H-MMA or BisGMA/TEGDMA disks. H-MMA modified resins had less free monomer leaching than the unmodified resin, but showed similar properties in water sorption and contact angle values. All these results suggest that the biocompatibility of H-MMA modified dental neat resins is as good as that of commercially used BisGMA/TEGDMA resin and H-MMA has potential applications in dental composites.

Resins	Contact Angle (°)	Percentage Weight Loss (%)	Water sorption (%) (1 wk)	Normalized Cell Number
BisGMA/TEGDMA	63.2 (2.5)	0.92 (0.37)	2.41 (0.02)	0.48 (0.37)
10 % H20-MMA	65.1 (2.2)	0.82 (0.38)	2.05 (0.08)	0.63 (0.48)
10 % H30-MMA	65.3 (3.0)	0.79 (0.45)	2.15 (0.07)	0.59 (0.42)
Polystyrene	78.9 (3.6)	-----	-----	1.00 (0.52)

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Translucency/Opacity of Composite Resins by Contrast Ratio. M.S. AFFLECK* G.E. DENEHY, M.R. BOUCHLICHER, M.A. VARGAS (The University of Iowa, Iowa City, IA, 52242, USA).

Translucency/Opacity of the natural dentition should be simulated in order to create optimal esthetic dental restorations. Modern composite resin materials attempt to restore the color and appearance of natural teeth. Current composite resin systems however, display various degrees of translucency/opacity. The purpose of this study was to characterize the translucency/opacity of sixty-six current proprietary composite resins and compare the values to enamel and dentin samples. Composite resin discs with diameters of approximately 10 mm were made by injecting material onto a silicone coated glass slide and flattened to 400-500 microns with another silicone coated glass slide and light cured for sixty seconds. The disc surfaces were smoothed wet using 1000 grit silicon-carbide paper, to a final thickness of 400 ± 10 microns. The samples were stored in distilled water in lightproof containers. The percent light reflectance was obtained by diffuse transmission measurements using an integrating sphere attachment in a spectrometer from 700-380 nm. A white background was used as the standard and the resin samples were then scanned against the white, and then a black background. The values obtained by contrast ratio (CR) of resins varied. Statistical analysis with ANOVA and Duncan's multiple range test showed significant differences between CR of composite resins ($p < 0.0001$). This suggests that different composite resins render different translucency/opacity and this characteristic should be considered when selecting the restorative material to restore the natural dentition. This study was supported by the University of Iowa DOWS research award.

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Evaluation of the Infiltration of Restorations after Dental Bleaching. M.POLONIATO, C.G.R.SARTORELLI*, B.S.SILVA, J.F.F.SANTOS (Univ. of São Paulo - Depto of Dental Materials - São Paulo - Brazil,)

This research aims at evaluating the infiltration on class II restorations after bleaching treatment. Then 12 pre-molars were selected from which 8 were submitted to the bleaching treatment with Nite White Excel 2® (Dental Discus) for 8 hours at 37°C for 21 days, the remaining time they were stored in distilled water at 37°C. All the teeth received cavities preparative in mesial and distal with the following approximated dimensions: 4mm of width, 1,5 mm of the depth and 6 mm of height. The cavities finished in enamel or dentin. Then, the non-bleached teeth and some of the bleached ones were restored immediately after the end of the bleaching treatment, and the remaining ones after 14 days. Bond 1® and Alert® (Jeneric/Pentron) were used to fill up the cavities following the manufacturer's instructions. The restored teeth were submitted to 700 thermal cycles (5-55° C) and soon after waterproof and immerged in blue of metileno solution at 1% for 4 hours. The teeth were sectioned in the mesio-distal sense, sanded and they were analyzed by three assessors receiving scores from 0 to 5 (0 without infiltration and 5 the maximum infiltration). The assessors, after that, were submitted to the Friedman test, obtaining high correlation degree. The scores presented a normal sample distribution and afterwards they were submitted to Analysis of Variance, which hasn't presented a meaningful difference in the bleached teeth between the enamel (4,250) and dentin (4,625) infiltration and the analyzed times: immediate (4,500) e 14 days (4,375), just showing difference between the bleached (4,250) and the non-bleached (1,500) enamel. We can conclude that the bleaching treatment affects the infiltration meaningfully especially in enamel.

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Isolation of Human Salivary Esterase Activities Associated with Composite Biodegradation. B.A. LIN*, F. JAFFER, Y. TANG, and J.P. SANTERRE (Faculty of Dentistry, University of Toronto, Canada).

Studies have demonstrated the ability of cholesterol esterase (CE) and pseudocholinesterase (PCE) as well as human saliva (HS) to degrade the monomer components of dental composite resins. Further work has shown that CE preferentially hydrolyses Bis-phenyl glycidyl dimethacrylate (BisGMA) over triethylene glycol dimethacrylate (TEGDMA), while the reverse is observed for PCE. Of clinical relevance is the presence of esterase activity similar to CE and PCE within HS. The purpose of this investigation was to isolate the different fractions of esterase activities from HS and to study their effects on BisGMA and TEGDMA. Whole saliva samples from 8 human subjects were collected, homogenized, centrifuged, pooled and freeze-dried. Samples were fractionated at 4°C on a 16/70 gel filtration column containing Sephracryl S200 media. The column was eluted with 40 mM sodium phosphate buffer, pH 7.2. Each fraction was assayed for CE-like activity using p-nitrophenyl butyrate (PNPB) and for PCE-like activity using butyrylthiocholine (BTC). Selected fractions were then incubated with BisGMA or TEGDMA and their degradation was monitored using high performance liquid chromatography (HPLC). Analysis of the data showed that distinct isolates of CE and PCE-like activities were reproducibly obtained from the pooled HS. Salivary fractions with relatively higher levels of CE-like activity preferentially degraded BisGMA, while TEGDMA was appreciably degraded by fractions with either of the esterase activities. It is concluded that the distributions of distinct esterase activities in HS define the extent to which selected monomers of composite resins are degraded. Supported by MRC and NSERC.

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Color Stability of Resin Cements after Aging and Water Storage. R.M. FAY*, M.S. KONINGS, J.M. POWERS (University of Texas-Houston Dental Branch, Houston, TX; 3M Dental, St. Paul, MN, USA).

The purpose was to determine the effects of accelerated aging and water storage on the color stability of 4 light-cured (LC) and dual-cured (DC) composite resin cements (RelyX, RX-LC; Variolink II, VL-LC, VL-DC; Nexus, NX-LC, NX-DC; Calibra, CB-LC, CB-DC). Color of specimens was measured on a reflection spectrophotometer at baseline. Half the specimens were treated with accelerated aging in an aging chamber and half were stored in distilled water at 37 C and 100% RH for 1 week as a control. After treatment, color was measured and ΔE^* was calculated. Means (n=5) and standard deviations of ΔE^* are listed. ANOVA showed significant differences. Tukey-Kramer intervals ($p<0.05$) for

ΔE^*	RX-LC	VL-LC	NX-LC	CB-LC	VL-DC	NX-DC	CB-DC
Aging	2.2 (0.5)	13.6 (1.2)	2.4 (1.7)	2.6 (1.0)	8.5 (2.8)	4.8 (1.3)	3.9 (0.5)
Water	1.7 (0.7)	2.0 (1.1)	2.5 (1.1)	2.3 (0.6)	1.8 (0.7)	1.6 (0.5)	2.0 (0.6)

comparing ΔE^* of 2 conditions and 4 cements were 0.6 and 1.2, respectively. There were no significant differences in ΔE^* among the cements stored in water. Color changes of VL were significantly different from RX, CB and NX. Dual-cured NX and CB had greater color changes than light-cured NX and CB, whereas light-cured VL had a greater color change than dual-cured VL. Perceptible color changes ($\Delta E^*>3.3$) were noted in aged specimens VL-LC, VL-DC, NX-DC, and CB-DC, while no perceptible color changes were noted in specimens stored in water. Supported by 3M Dental.

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Color Stability of Composite Resins Soaked in Various Daily Drinks. J. D. LAFUENTE, L. PIEDRA*, J. M. POWERS (School of Dentistry, University of Costa Rica, Costa Rica; Houston Biomaterials Research Center, Houston, Texas)

This study is to determine the effect of daily drinks such as coffee or Coke on composite resins. Sample disks, 2 mm thick and 10 mm diameter were made out of six different composites: Z-100 A2, and A3.5, Charisma A2, Heliomolar A2, Amelogen A2 and ceromer Artglass A2 (n=5). Specimens were then measured by CIE L*a*b* on a reflection spectrophotometer with white background under source C. Specimens were then submerged in coffee, Coca Cola and Grape Gatorade. All liquids were changed every day for fifteen days. Specimens were color measured after two weeks, and compared with their original measurements. ΔE^* was calculated for all specimens. Mean ΔE^* of composites immersed in coffee, standard deviation in parenthesis. Two-way ANOVA calculated at a 0.05

Composite	Z-100 (A2)	Charisma	Z-100(A3.5)	Heliomolar	Artglass	Amelogen
Coffee	1.61 (0.88)	3.67 (1.17)	1.24 (0.73)	2.00 (0.66)	1.46 (0.44)	1.57(0.67)

significance level was used to compared the ΔE^* of all specimens, they were compared by composite and by solution. Post-hoc analysis was performed using Scheffe's test due to differences in sample size among groups. Charisma had the highest color change of all groups immersed in coffee, Z-100 shade A3.5 had the highest color change among groups immersed in Coca Cola. Gatorade produced a statistically significant smaller color change than coffee and Coca Cola. Charisma immersed n coffee was the only composite that had a DE* big enough to be detected by the human eye (Above 3.3) Everyday drinks can stain composites, some will be affected more than others depending on the type of drink.