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Solvation of Dried Dentin Matrix by Water and Other Polar Solvents. D.H. PASHLEY¹, R.M. CARVALHO², F.R. TAY³, K.A. AGEE¹, W-K LEE* (Medical College of GA¹, Bauru Dent Sch², Univ of Hong Kong³, Chonbuk Nat Univ*).

The aim of this work was to evaluate the interactions of solvents used in adhesive dentistry with the dentin matrix. This study measured the pressure developed by solvents when they were added to dried, demineralized dentin matrix. Using extracted human teeth, mid-coronal dentin was used to prepare 2x2x1 mm specimens that were demineralized in 0.5M EDTA (pH 7) for 7 days (25°C). After drying at 0% RH, each specimen was held between a fixed steel plate and a sensing plate connected to a 5000 g load cell. Addition of water produced a swelling force of up to 500 g/mm² over 30 min. This same specimen was then redried and exposed to the following solvents in a repeated measures design: methanol (M), ethanol (E), propanol (P), butanol (B), N,N-dimethylformamide (N), acetone (A), hydroxyethylmethacrylate (H), formamide (F), ethylene glycol (EG) or water. The results were analyzed by one-way ANOVA and Tukey's test at $\alpha=0.05$. The resulting solvation pressures (g/mm²) were ($\bar{x} \pm SD$, N=8):

Solvents	M	E	P	B	N	A	H	F	EG	Water
\bar{x}	309	13	4	0	2	3	4	72	132	445
SD	114	4	2	3	3	3	2	15	33	126

Regression analysis showed that solvation pressure was inversely correlated ($R^2=0.86$) with the cube root of the molecular weight of the solvents and positively correlated ($R^2=0.79$) with the Hansen's solubility parameters for hydrogen bonding. Conventional bonding solvents (ethanol, acetone, HEMA) did not solvate the matrix. Supported, in part, by grant DE06427.

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