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Empirical Changes with Bleaching on Subsurface Enamel and Dentin Color

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Vital tooth bleaching is a common procedure in the United States. Sources of bleaching include in-office applied bleach, in office prescribed bleach and over the counter home use whiteners. Despite the clinical success of this technique there is uncertainty over the location and magnitude of optical changes which occur in teeth with bleaching. **Objectives:** This study examined empirical color variations inside of teeth bleached externally. **Methods:** Extracted human premolars were analyzed for external CIELAB (L*a*b*) color with a Fuji-1000CCD and stratified into treatment groups for kinetic study. Teeth were subsequently subjected to bleaching with whitening strips (Crest® Whitestrips® Supreme containing 14% hydrogen peroxide) in a cycling protocol including topical bleach exposure alternating with storage in pooled human saliva. Plots of color changes with time of bleaching and % color change were determined externally and then teeth hemi-sectioned along their vertical axis. Polishing of these flat faces revealed subsurface enamel, DEJ and dentin. Samples were analyzed for internal color with digital imaging to produce CIELAB line scans. **Results:** Systematic bleaching of teeth produced changes in internal colors (L, a, b) which were most consistent in L* and b* and most consistent in outer enamel. For example, with 0, 10- 25, 50, 100 % bleaching, color values for external, mid and near DEJ enamel were:

	0 Bleach	10-25% Bleach	50% Bleach	100% Bleach
External	71.2 (2.1)a	73.0 (1.4)b	74.4 (2.8)c	74.8 (3.8)d
Mid	70.5 (2.6)a	71.8 (3.6)a	73.8 (1.9)b	74.5 (1.9)c
Near DEJ	70.6 (2.4)a	69.9 (3.1)a	72.3 (2.1)ab	73.8 (1.9)b

Likewise results were seen with b*. Dentin and dej showed inconsistent color responses with bleaching extent though a trend to see bleaching in dentin was seen when at 100 % bleaching (L* approaching 81). **Conclusion: Color response within teeth, empirically measured here, is greatest in tooth enamel showing a rate dependent pattern – outer enamel changing first, with far less consistent effects in dentin realized at only extreme bleaching conditions.**