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COLOR VISION OF FEMALE CARRIERS AND COLOR VISION DEFICIENCY SUBJECTS EVALUATED WITH THE CAMBRIDGE COLOUR TEST

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Abstract:

Purpose: To evaluate the color vision of subjects with congenital color vision loss and female carriers of a deutan color defect we performed the Cambridge Colour Test (CCT - Cambridge Research Systems Ltd.) in a group from São Paulo, Brazil. **Methods:** We evaluated 19 control (5 men and 14 women) and 15 daltonic (14 men and 1 woman) subjects. Color discrimination thresholds were measured using the CCT along the protan (P), deutan (D) and tritan (T) axes, as well an ellipse around CIE 1976 coordinates $u'=0.1977$ $v'=0.4689$. Thresholds were expressed in $u'v'^*103$ units of vector length within the CIE 1976 chromaticity diagram. A genetic screen using real time quantitative polymerase chain reaction was used to estimate the relative number of L and M cone opsin genes. **Results:** L and M genes estimated for control group subjects were consistent with a trichromatic color vision. However three females were carriers of a deutan defect (more than one L gene in the X chromosome sequence). The average color discrimination thresholds of the control group were 36 ± 11 , 36 ± 13 and 54 ± 19 $u'v'^*103$ for the P, D and T axes respectively. The discrimination ellipses had a mean area of 580 ± 279 , 602 ± 255 and 2676 ± 1863 ($u'v'^*103$)² for the ellipses 1, 2 and 3, respectively. No statistical difference ($p>0.05$) was found between female carriers and control group for the P, D and T color thresholds and discrimination ellipses. L and M gene estimation for the daltonic group characterized 5 protan subjects, 9 deutan subjects and 1 subject whose dichromatic phenotype was caused by a polymorphism (C203R) in the M opsin gene. In the daltonic group the mean color discrimination threshold for the P, D and T axes was, respectively, 536 ± 120 , 242 ± 67 and 54 ± 9 $u'v'^*103$ for the protan group, and 285 ± 101 , 797 ± 274 and 72 ± 27 $u'v'^*103$ for the deutan group. Comparing these results with those obtained in the control group, there was a very large difference in the protan and deutan thresholds between the groups ($p<0.05$) unlike the tritan threshold which remained similar to the control group ($p>0.05$). **Conclusions:** There was no color vision loss in female carriers of protan defect when evaluated with the Cambridge Colour Test.

Key word: Color vision. Perception. Psychophysics. Genetics.

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