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Independent Small Group Discussion Write-up

1. **What was the motivation for this study? (e.g. big picture questions motivating experiments, prior work motivating experiments, etc)**

The purpose of this study was to prove if addition of a color opsin can produce trichromatic vision in color blind primates- and perhaps this can also later help colorblind humans to see.

2. **List the key methodological details (species, preparation, recording/ anatomical techniques, data analysis methods)**

Adult squirrel monkeys were used to test if the addition of the third opsin would allow trichromatic color vision. Adeno-associated virus was used to insert the human L-opsin gene, this wad injected into sub-retinal layers. After 70 weeks, the gene was clearly expressed as shown through cell mosaics. The Cambridge Colour Test, a simple mosaic of opponency, was used to test e L or the M cell failure. Cofocal microscopy was used to directly measured changes in the retina.

3. **For each figure, describe the important points including how the authors interpret the findings and what the findings may actually show.**

Figure 1)

This shows methods used.

a) Adeno-associated virus was used to insert the human L-opsin gene, the enhancer and promoter regions are shown in this figure. Transcriptors produced M cones but not other types that already existed.

b) stimuli used for experiment, red glowing screen to stimulate the M cones.

c) Map of responses for the retinal cells expressing the genes injected before. The circles show the injection sites, there's a comparison at 70 weeks in figure E.

d) The retina photograph showing effects of the L-opsin injection

e) Confocal microscopy shows corresponding results to the mosaics.

f) 15–36% of M cones expressed the injected gene.

Figure 2)

a)This shows the Cambridge color test adapted for monkeys to test color blindness. Cute monkey distinguishes 16 hues of colors as threshold was changed through out the experiment.

b & c) This shows pretest results. These psychometric functions measure the true perception monkeys had of different hues versus the expected perception who trichromatic vision. Proves they are red green color blind.

d) Theoretical model that explains this color blindness as a color shift instead.

e) Results of trichromatic monkey are shown against the color blind monkey.

Figure 3)

a) Monkeys' thresholds for green-red color opponency changed in as little as 20 weeks, there is sudden sharp decline shown in the graph corresponding to that.

b) Comparison of pre and post therapy thresholds.

c) The monkey's threshold for the 490 nm light wavelengths had truly changed as if they were trichromatic. SEM was low.

4. What is your assessment of the overall findings? Did the experimental data support the authors' interpretation? Why or why not?

This shows that expression of the L-opsin gene they used can create trichromatic color vision, the robust levels of transgene had been correlated with better perception of hues in the experiment. However it is unknown from this article whether the neural circuitry had adapted to this new color vision.

5. Describe new insights that you gained from the small group discussion of this paper.

I realized that the transgene had been injected specifically into a region by the virus, not just L/M-opsin enhancer and promoter. I also found that mosaics show interesting opponency.

6. List all of your questions and/or points in the paper that you did not understand.

I don’t understand how color hues were tested for the monkeys, it also seems very sudden that the opsin expression changed at 20 weeks.