A comparative behavioral study: Olfactory efficiency in of PMCA 2 knock out mice with that of wild type mice

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Plasma membrane Calcium ATPases (PMCAs) are one of the important calcium extrusion mechanisms in mammalian cells. PMCA 2, being the most calcium calmodulin sensitive isoform, plays an important role in calcium clearance after odor presentations. Previous work from our laboratory showed that the rate of calcium clearance after odor stimulation is slower in the PMCA 2 Knock out (KO) mice than that of wild type mice. We are interested to see the behavioral consequence of this slow calcium clearance in these KO mice and therefore we are using behavioral studies to ask the research question about their sense of smell.

In classical conditioning experiments, odorants amyl acetate and geraniol have been used as conditioned stimulus (CS); CSs were paired with mild electric foot shock as unconditioned stimulus (US) in both control and experimental groups. The responses of the animals were recorded using Video fear conditioning system (Med associates Inc.). Motion activities of animals were analyzed to determine whether they show a change in activity which indicates an associate between the CS with the US. Data from the wild type animals showed clear association between the odor stimuli and the shock whereas the KO mice did not show consistent results. We have also used a non-odor stimulus (white house light) as CS and the KO mice produced completely different response pattern with this stimulus than that of the wild types.

Conditioned odor aversion was also performed using two bottle preference tests in which the animals were conditioned with a specific concentration of the odorant geraniol and injected with LiCl (IP) which causes stomach upset. Then, upon testing with descending concentrations of the same odorant, wild types showed a clear rejection to geraniol solution when it was used in conditioning concentration or close to that concentration, but knock outs did not show any rejection.

Taken together, these results indicate that the KO mice may not be able to perform an odor task with the same efficiency as that of wild types and also not all behavioral paradigms are sufficient to test their behavior. Further experimentations are required to determine whether or not these KO animals can learn or respond to odors.

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