

## Abstract

# THE ROLE OF GLUTAMATE NEUROTRANSMISSION IN THE VENTRAL TEGMENTAL AREA IN THE EXPRESSION OF CONDITIONED APPROACH LEARNING

by

Priscila Hachimine

Advisor: Robert Ranaldi, Ph.D.

Conditioned stimuli (CSs) come to function as CSs by acquiring the capacity to activate the same mesocorticolimbic dopamine (DA) neurons activated by primary rewards, producing conditioned activation of these neurons and their associated motivational states. This model stipulates that CSs activate mesocorticolimbic DA systems through the activation of glutamate receptors on DA neurons in the ventral tegmental area (VTA). We tested the hypothesis that glutamate receptor stimulation in the VTA is necessary for the expression of conditioned approach. Rats were tested in a conditioned approach protocol that consisted of 7 consecutive conditioning sessions (light presentations and food were paired), one session with no light or food and one test session with only light stimulus (CS-only) presentations. The number of head entries during the CS and pre-CS (baseline) periods was used to calculate difference scores. Bilateral VTA microinjections of glutamate receptor antagonists were made prior to the

CS-only session. Kynurenic acid (ionotropic glutamate receptor antagonist; 1.125–4.5 µg/0.5 µl) significantly reduced difference scores compared to vehicle (0 µg), whereas MCPG (metabotropic glutamate receptor antagonist; 1.875–7.5 µg), AP-5 (NMDA antagonist; 0.03125–2.0 µg), and NBQX (AMPA antagonist; 0.5–4.0 µg) had no effects. When AP-5 and NBQX were administered simultaneously at doses of 0.25/4.0 and 2.0/4.0 µg, respectively, the combination significantly reduced the difference scores compared to 0/0 µg, indicating a reduction in the expression of conditioned approach. These findings indicate that either NMDA or AMPA receptor stimulation in the VTA is sufficient, but neither is necessary, for the expression of conditioned approach learning to occur.