Ailyn P. M. Smith
High School
Destrehan High School, Destrehan, Louisiana

Dr. Peter Winsauer
LSUHSC

"Oral Presentation of Food and Ethanol or Quinine Under a Multiple Schedule"

Background: This study builds on previous work showing that rats will reliably press a lever (respond) to receive food or ethanol when this opportunity occurs multiple times in the same behavioral session. In this procedure, rats were initially trained to respond for food and ethanol (18% v/v) or food and oral oxycodone (0.1-3.2 mg/ml); however, subjects were also willing to respond for water (dH2O) at levels nearing those for ethanol, which raised concerns over the effectiveness of ethanol as a positive reinforcer in this procedure. To better understand the effectiveness of ethanol as a reinforcer in this procedure, we directly compared responding for ethanol with responding for dH2O and responding for 0.05% quinine, a bitter tasting substance. This serves as a valuable tool for investigating alcohol's reinforcing effects (McCane, et al., 2021).

Methods: Rats were trained under a multiple schedule, in which periods/components of responding for food presentation alternated with components of responding for ethanol (n=8) or oxycodone (n=4). During the respective components, subjects had to respond on the lever 10 times to receive one food pellet or 0.1 ml of either drug solution. Further, different concentrations of ethanol or doses of oxycodone were presented to the subjects until they met one of two stability criteria: (1) 3 days in which the level of responding did not differ from the mean level by more than ±20%, or (2) a maximum of 8 days. The dependent variables for these components were the response rate in responses per second, the amount of pausing before each reinforcer (i.e., pre-ratio pausing or PRP), the number of drug presentations per session, and total drug intake. In the second part of this experiment, both dH2O and quinine availability were interspersed with ethanol (18%) availability until the same stability criteria were met. Blood ethanol concentrations (BECs) were collected during stable responding for ethanol, dH2O, quinine, or following naltrexone treatment.

Results: Response rate for food remained consistently high, while response rates for ethanol and oxycodone were lower overall. Response rates were also decreased by increasing the concentration of ethanol or dose of oxycodone available; however, these increases in concentration, or dose, non-significantly increased PRP while significantly increasing total intake. These effects occurred regardless of their training history (i.e., ethanol or oxycodone). Naltrexone had little impact on food-maintained behavior, but led to small reductions in ethanol intake and BEC, while also producing small increases in oxycodone intake. Importantly, quinine presentation decreased response rate and increased PRP to a greater extent than those for both ethanol and dH2O.

Conclusions: Our initial findings indicated that increasing both ethanol concentration and the oral oxycodone dose available decreased response rate and the number of presentations that were obtained by the subjects during the session, but overall ethanol or oxycodone intake or total dose was still increased. Prior results also indicated that naltrexone decreased responding for ethanol presentation to a greater extent than oxycodone presentation. In the present experiment, quinine presentations were reduced to a greater extent than either presentations for ethanol or dH2O, indicating that quinine was less reinforcing than both ethanol and dH2O.

References

McCane, A. M., Auterson, C. D., DeLory, M. J., Lapish, C. C., & Czachowski, C. L. (2021). Differential effects of quinine adulteration of alcohol on seeking and drinking. Alcohol, 92, 73–80. https://doi.org/10.1016/j.alcohol.2021.01.003