Doug Matthews

Professor
Department of Psychology

Chronic Intermittent Ethanol Administration During Adolescence Produces Sex Dependent Impairments in Behavioral Flexibility and Survivability

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Ethanol exposure during adolescence produces cognitive that can last into adulthood. In the current study, we investigated if chronic ethanol exposure during adolescence alters cognition over the lifespan. Female and male rats were treated with ethanol during adolescence and then tested every 4 to 5 months on a series of cognitive measures. Chronic ethanol selectively impaired cognitive in both female and male rats, although the pattern of results was different as a function of sex. The current results demonstrate that adolescence is a unique period of development where chronic ethanol exposure produces long-lasting, selective cognitive impairments across the lifespan.

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Chronic Intermittent Ethanol Administration during Adolescence Produces Sex Dependent Impairments in Behavioral Flexibility and Survivability

Douglas B. Matthews *, Samantha Scaletty, Sarah Trapp, Abigail Kastner, Amelia M. Schneider, Areonna Schreiber and Gillian Rossmann

Department of Psychology, University of Wisconsin—Eau Claire, Eau Claire, WI 54701, USA; scaletty.samantha@mayo.edu (S.S.); strapp1@binghamton.edu (S.T.); kastnera@musc.edu (A.K.); schn1170@umn.edu (A.M.S.); schreiber.areonna@mayo.edu (A.S.); gillianrossmann@me.com (G.R.)
* Correspondence: matthedb@uwec.edu

Abstract: Chronic intermittent ethanol exposure during adolescence produces behavioral impairments and neurobiological changes that can last into young adulthood. One such behavioral impairment is reduced behavioral flexibility, a behavioral impairment that has been correlated with the risk for increased ethanol intake. In the current study, we investigated if chronic intermittent ethanol exposure during adolescence alters cognition, including behavioral flexibility, over a 22-month testing period. Female and male rats were treated with either 3.0 g/kg or 5.0 g/kg ethanol via gavage in a chronic intermittent fashion during adolescence and then tested every 4 to 5 months on a series of cognitive measures in the Morris water maze. Chronic intermittent ethanol selectively impaired behavioral flexibility in both female and male rats, although the pattern of results was different as a function of sex. In addition, female, but not male, rats were impaired in a short-term relearning test. Finally, male rats administered ethanol during adolescence were significantly more likely to not survive the 22-month experiment compared to female rats administered ethanol during adolescence. The current results demonstrate that adolescence is a unique period of development where chronic intermittent ethanol exposure produces long-lasting, selective cognitive impairments across the lifespan.

Keywords: chronic intermittent ethanol; adolescence; aged; behavioral flexibility; learning

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1. Introduction

Alcohol (ethanol) is one of, if not the most, used and misused drug in the world [1]. Globally, alcohol misuse was attributed to approximately 3 million deaths, and for individuals between the ages of 15 and 49, alcohol was the first-leading risk factor for death and serious bodily harm [2]. Furthermore, in the United States, over 85% of people report having consumed alcohol in their lifetime, and the majority of people report having consumed alcohol in the last month [3]. Understanding the impact of alcohol exposure is a critical public health concern.

The majority of individuals first consume alcohol during adolescence [4]. For example, almost 40% of 12- to 20- year-olds have consumed alcohol at least once during their life, while ~17% of males and ~20% of females in this age group have consumed alcohol in the past month [5]. Furthermore, adolescents are not simply consuming alcohol, but the consumption pattern is often in a dangerous binge pattern [5]. It is therefore critical to understand how binge alcohol consumption during adolescence impacts the health of individuals across the lifespan.