Ethanol Induced Hypothermia and Clearance Curves Across the Ages

Introduction
By the year 2030, 20% of the US population will be over the age of 65, providing a potential strain to the health care system (U.S. Census Bureau). A large segment of older individuals consume alcohol at dangerous levels with up to 3% meeting the diagnostic criteria for an alcohol use disorder (AUD). 33% of the elderly with an alcohol use disorder did not begin risky drinking until later in life, often following a major life change. These individuals have been termed Type 1 alcoholics. Little is known about the consequences of alcohol use in later life due to few animal studies investigating alcohol in aged rats. Previous research has shown that adolescent and adult rats have significantly different patterns of ethanol-induced hypothermia that varied by dose (Ristuccia & Spear, 2008). The current experiment investigates the effect of ethanol on hypothermia and aging by assessing adolescent, adult and aged rats following ethanol injection.

Methods
Subjects: In the first experiment (figures 1-3), twelve adolescent (postnatal day 28 on arrival), 12 adult (postnatal day 70 on arrival) and 12 aged (postnatal age 19 months on arrival) male Sprague-Dawley rats were used to investigate the effects of acute ethanol exposure on hypothermia as measured by anal core body temperature via a digital physiomet monitor (Physiotemp Instruments, 154 Huron Avenue, Clifton, NJ 07013 USA). In the second control experiment (figure 4), six adult animals were used to assess core body temperature following saline injection.

Ethanol exposure: In the first experiment, animals were randomly assigned into one of three alcohol dose sequences (n=4 per sequence per age). Animals received an i.p. injection of 1.0 g/kg, 2.0 g/kg, or 3.0 g/kg of ethanol once every seven days for 21 days (i.e. a total of three i.p. injections over 21 days). The order of alcohol dose injection over the 21 days was counterbalanced so that three sequences of injections existed to remove any potential carryover effects of previous alcohol administration. Animals were first tested on postnatal day 30, postnatal day 72 and approximately postnatal age 19 months.

Testing: On the first test day, a baseline core body temperature was collected immediately prior to injection. Following alcohol administration, core body temperatures were re-determined every 60 minutes for the next 360 minutes. Seven days and 14 days later, animals were re-injected with the appropriate ethanol dose according to the counterbalanced sequence following baseline core body temperature readings and tested in the same manner.

Blood alcohol levels over time: To determine the effect of age on blood alcohol levels, subjects had their tails nicked 60 minutes post alcohol injection and a plasma sample was collected at 60 minutes, 180 minutes and 300 minutes later. Blood alcohol levels were determined via an AM1 Analox machine via manufacture specifications.