Using Animal Models to Identify Clinical Risk Factors in the Older Population Due to Alcohol Use and Misuse

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- UWEC
- MOPF

In Addition to: Samantha Scaletty, Abbey Kastner, Meredith Bauer, Amelia Schnieder, Sarah Trapp, Armeena Schriber

We Are Moving Where? (Melissa, when told there are cities north of Greenbay)
Wisconsin as the America’s “Alcohol Research Laboratory” (Wall Street Journal)
- Milwaukee
- Fond du Lac
- Janesville
- La Crosse
- Racine
- Madison
- Sheboygan
- Greenbay
- Wausau
- Oshkosh
- Eau Claire (9th)
- Appleton

12 of the top 20 Drunkest Cities in the United States are in Wisconsin

Alcohol Drinking Rates
- Wisconsin adults drink more alcohol than adults in 49 of the 50 states in the USA
- Least Healthy State in relation to dangerous alcohol use (America’s Health Ranking, Annual Report 2020)
  - Defined in terms of binge drinking
    - 4+ drinks for females
    - 5+ drinks for males
  - Defined in terms of heavy drinking
    - 8+ drinks for females/week
    - 15+ drinks for males

% Excessive Drinking by County

Many Thanks
Why Investigate Alcohol Use in Older Populations?

- The number of individuals over the age of 60 are predicted to increase from 900 million to 2.1 billion by 2050.
- Older people consume alcohol often in a binge type pattern.
- The percent increase in alcohol drinking in older adults is greater than the percent increase in alcohol drinking in younger adults.
- Little is known about the impact of alcohol, either acute or chronic, on the aging brain.

Why Investigate Alcohol Use in Older Populations?

The number one lifestyle predictor for development of dementia including Alzheimer’s Disease is a diagnosis of an Alcohol Use Disorder.

Why Study Alcohol in the Older Population?

DEADLY FALLS | WISCONSIN’S SENIORS
Wisconsin still has nation’s highest rate of deadly falls among older adults
David Wahlberg | Wisconsin State Journal
Jan 4, 2021

It’s not clear why Wisconsin tops the charts in fatal falls, a topic the Wisconsin State Journal examined in a three-part series on March 1, 2019. Possible factors include icy winters; excessive drinking, including among the elderly; the population being older and whiter than the U.S. average; and officials here potentially reporting falls as a cause of death more than in other states.

Ethanol Produces Greater ARR Impairment in Adults

Is This A Boring Effect?

Aged Rats More Sensitive to Acute Ethanol
Impairment in the ARR is found at low doses

Baseline

Is this simply a BAC effect?

Accelerating Roto Rod
Typical measure of Ataxia

What about Roto-Rod?

Looking at BAC again

Impact of Ethanol on Low Dose Alcohol

No age difference
So…Older Adults Fall More…

- They consume alcohol.
- The alcohol consumption decreases motor coordination to a greater extent in aged animals.
- The alcohol consumption increases movement to a greater extent in aged animals.
- You move more and are less coordinated, you likely fall.

As A Health Care Provider

- Access alcohol use in all populations.
- AUDIT, quick 10 question assessment.
- Discuss mobility and impact on alcohol with patients.
- If a patient presents with a fall as a primary cause discuss alcohol use with them.

Acute Alcohol Produces Complex Changes in Spatial Memory Deficits in Aged Rats

Looking at BAC again

<table>
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<tr>
<th>Type</th>
<th>2 months</th>
<th>14 months</th>
<th>20 months</th>
<th>Non-spatial</th>
<th>Spatial</th>
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</thead>
<tbody>
<tr>
<td>Latency Difference Score (sec)</td>
<td>12.0 ± 1.2</td>
<td>16.5 ± 2.3</td>
<td>20.0 ± 3.4</td>
<td>8.0 ± 0.5</td>
<td>12.0 ± 1.2</td>
</tr>
</tbody>
</table>

Non-spatial

Spatial

Adults have higher BAC compared to aged

Matthews et al., 2020

Acute Ethanol, Age and Cognitively Spared Animals

Various Water Maze Tasks Employed (submerged)

Matthews et al., 2020
Cognitively Impaired

Important
- Understanding basic, subtle, cognitive function may be important to know as it relates to alcohol use in the patient population.

Understanding the Impact of Chronic Ethanol in Aged Animals

Various Water Maze Tasks Employed

AUD and Behavioral Flexibility
- Decrease in BF in abstinent alcoholics
- Decreased BF following high ethanol consumption in monkeys
- Decreased BF predicts which monkeys will engage in high ethanol consumption.
Bioinformatics pathway analysis highlights a protein pathway with two related proteins, PKCd and aCamKII that are impacted by Alzheimer’s Disease.

Important
- Long term alcohol consumers may have altered protein pathways in brain regions critical for cognition.
- Insulin pathways may be compromised complicating Type 2 diabetes care and management.

Conclusion
- Alcohol is the most used and misused drug in the world.
- Age matters.
- Active discussion of alcohol use in all demographics is critical.
- Finally, sex-dependent effects are likely to exist.
  - Doug discuss drinking rates in females.