
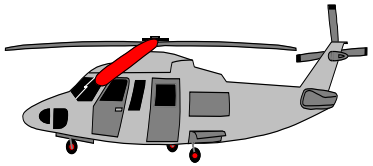

# Challenges in Assessing if Hangovers Increase the Risk of Motor Vehicle Crash (MVC) Injuries: Is Alcohol's Influence Greater Than Expected?


Gordon Smith[1], Patricia Dischinger[1],
Paul Marques[2], Jonathan Howland[3]

[1] National Study Center for Trauma & EMS
Shock Trauma Center, University of Maryland, Baltimore
[2]PIRE and [3]Boston University



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Charles McC. Mathias, Jr.
National Study Center
for Trauma and Emergency Medical Systems

William Hickey 1768

*My first return of sense or recollection was upon waking in a strange, dismal-looking room, my head aching horridly, pains of a violent nature in every limb, and deadly sickness at the stomach. From the latter I was in some degree relieved by a very copious vomiting.…I passed some moments in a state little short of despair.*”

# Introduction

- Elevation of blood alcohol concentration (BAC) is a well-recognized risk factor for motor vehicle crashes (MVCs)

- Little is known however regarding hangovers and crash risk.


# Aim

- Examine evidence that hangovers could increase injury risk
- Develop a methodology to determine if hangovers represent a real injury hazard
  - Measurement of hangovers
  - Biomarkers to identify people at risk for hangovers
    - Evidence recent heavy drinking when BAC zero
  - Surrogate measures of risk

# Hangovers : the neglected area of alcohol research

- After years of little research interest in hangovers, increasing interest in research on their etiology and impact
- Number recent review articles
- Etiology hangovers remains unknown
- Alcohol Hangover Research Group
  - Special issue Current Drug Abuse Reviews
    - Joris Verster

# What evidence of injury risk is there?

- Experimental evidence suggests that the residual effects of alcohol impair performance in simulated tasks
  - Occupational performance
    - flying and driving simulators
  - Neurocognative performance
  - Improved methods for measurement
- No studies examine real-world crash risk
  - Objective data to document hangovers was lacking

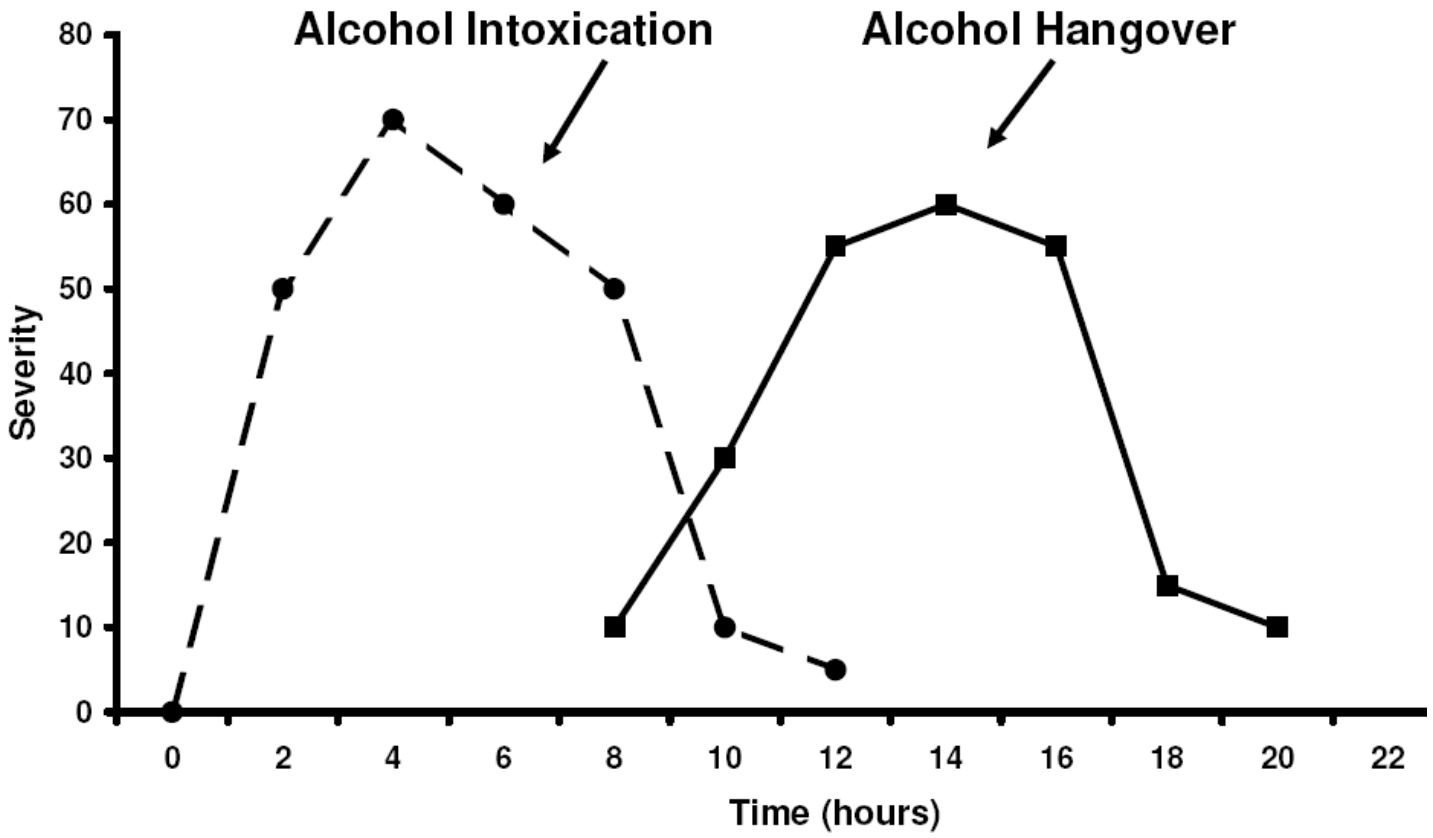
# BAC negative trauma patients have high prevalence problem drinking

- Studies screening for alcohol problems
- Trauma patients with negative BACs on admission
  - 12% met criteria for current dependence
  - 24% for lifetime dependence
  - 4-5 times higher than in the general population
- Are some injured drivers hung over?

# Definitions

- “Residual alcohol effects”:
  - any subjective, physiological, and/or behavioral effects of heavy intoxication
  - after blood alcohol concentration (BAC) has fallen to about zero.
- “Hangover”:
  - self-reported unpleasant residual effects:
  - feeling lousy, thirst, headache, dizziness, faintness, fatigue, nausea, stomach ache, and feeling as though one’s heart were racing.
  - validated Acute Hangover Scale measures hangover symptoms

Commonly observed changes over time in blood alcohol concentration (BAC) and alcohol hangover severity.
Joris Verster:Derived from data of Ylikahri et al. (1974).



# Measurement

- Hangover Incidence:

  "Rate your hangover now on a scale of 0 ("none") to 7 ("incapacitating").

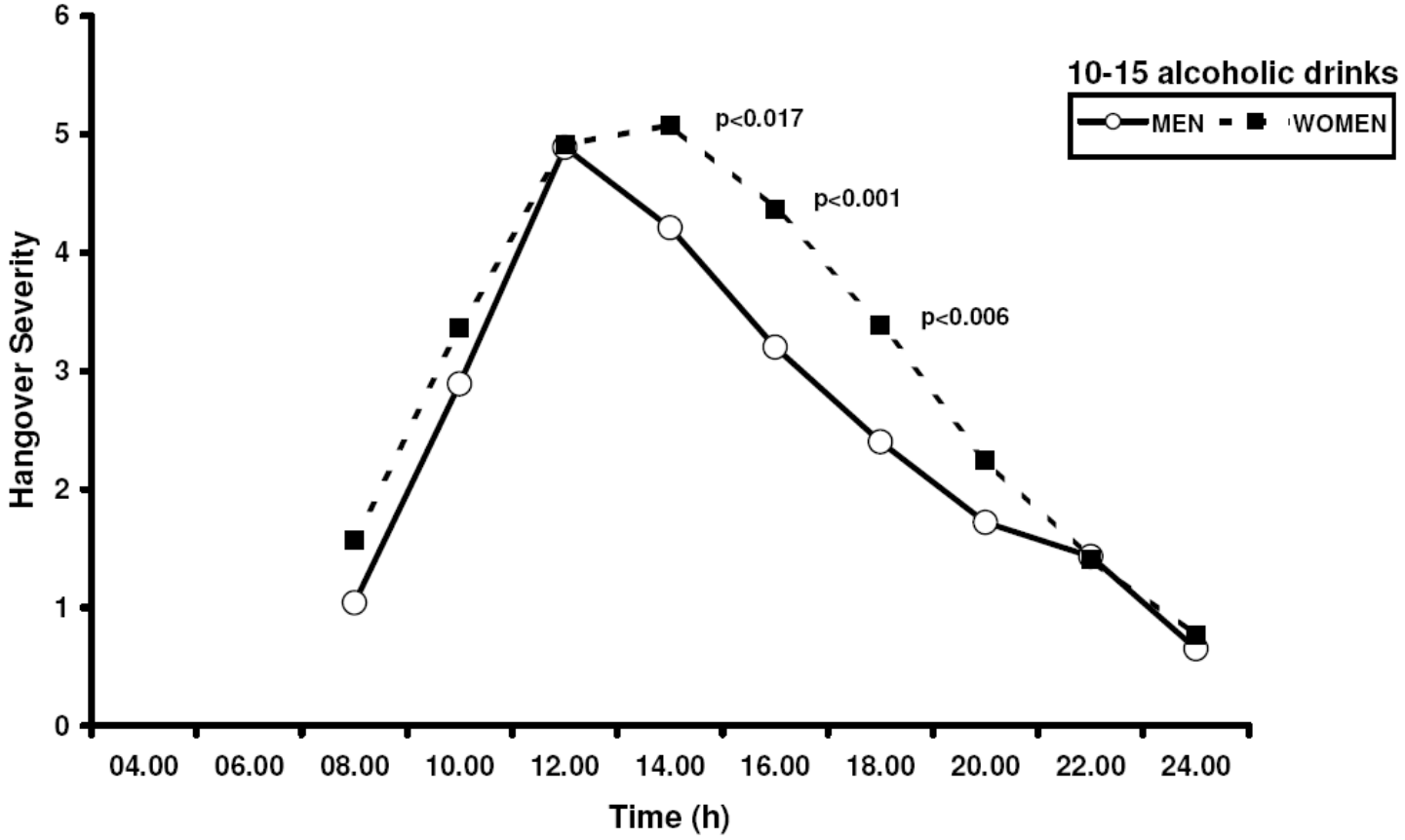
  *Hangover* if answer ≥ 1.

- Hangover Severity:

Acute Hangover Scale (Rohsenow, et al. 2007)

The sum of 9 validated items, rated from 0 ("none") to 7 ("incapacitating").

Hangover severity reported by men and women after consumption of 10 to 15 alcoholic drinks by time of day (Penning et al. 2010)



# Hangover Resistance

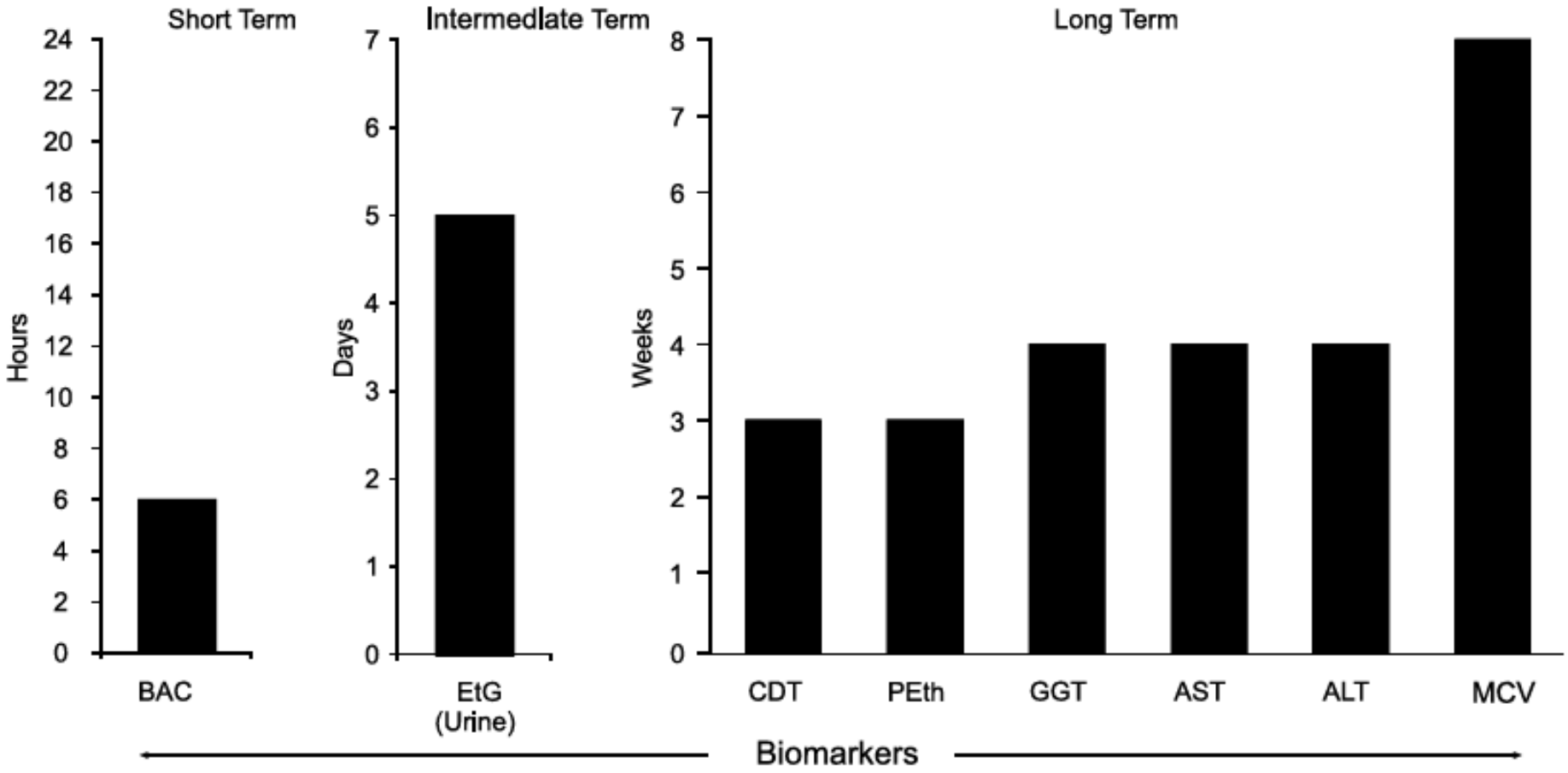
About 25% of the population is resistant to hangover in survey and experimental studies (Howland et al., 2008 a,b).

No hangover reported after drinking to BACs that produce hangover for most people.

# Hangover studies in real world crashes

- Major limitations in evaluating the effects of hangovers in non-experimental situations
  - Reliance on self reports of heavy drinking the night before
  - No objective marker available to detect residual effects when the BAC is zero
- Can we use biomarkers to indicate recent heavy alcohol use?

**Windows of Assessment for Various Alcohol Biomarkers (i.e., the period during which the biomarker level may remain high after it originally rose assuming that no further drinking occurred)**
**SAMSA 2006**

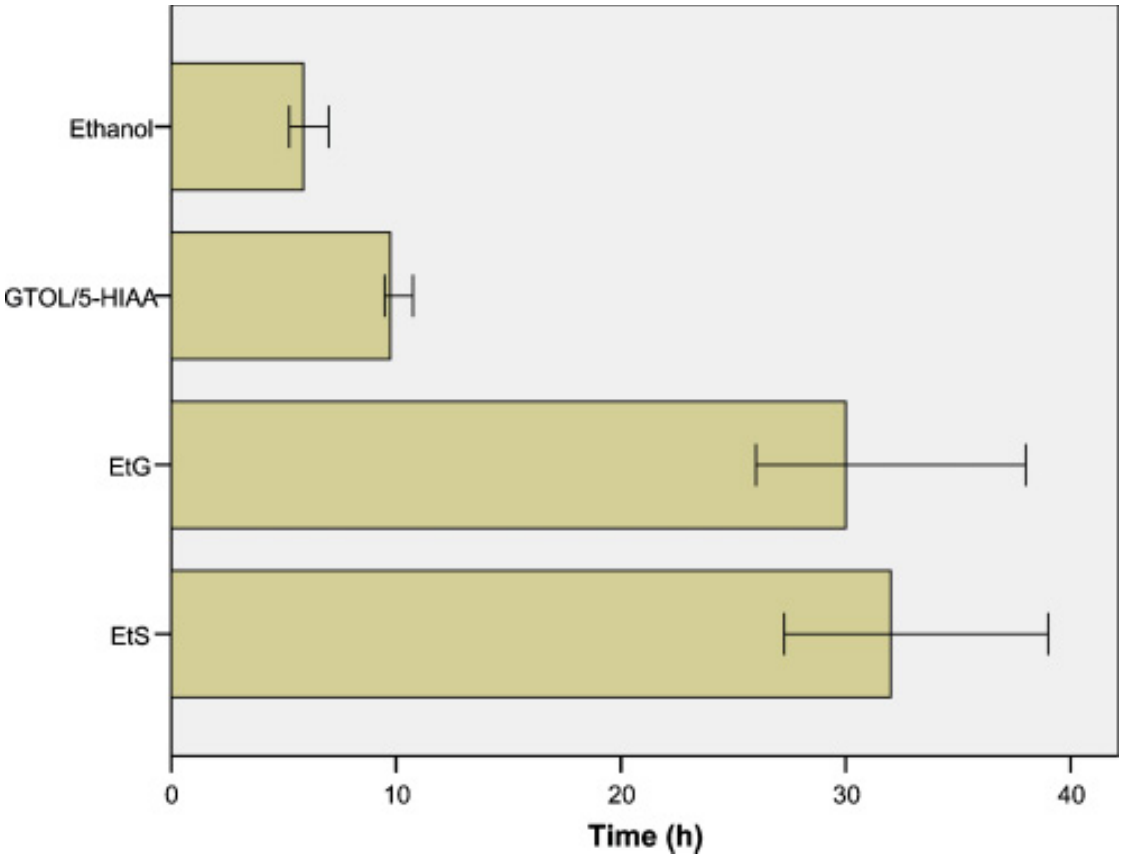



BAC=Blood alcohol concentration

# Biomarker

- Ethyl glucuronide (EtG) and ethyl sulfate (EtS) formed by alternate metabolic pathway for alcohol
  - Less than 0.5% alcohol metabolized this way
- Used in alcohol treatment programs to monitor abstinence
  - E.g., pilots or surgeons who lost license due alcoholism
  - Only formed after recent drinking
  - Identifies persons whose BAC now zero but who drank in past 20-30 hours

# Median detection times of ethanol, EtG, EtS, and GTOL/5-HIAA (n = 10) in urine samples after oral ingestion of 0.5 g/kg ethanol in a fasted state **Error bars represent 95% CI.**




Hoiseth G, Bernard JP, Stephanson N, et al. Comparison between the urinary alcohol markers EtG, EtS, and GTOL/5-HIAA in a controlled drinking experiment. *Alcohol Alcohol.* 2008;43(2):187-191.

# Hangover study

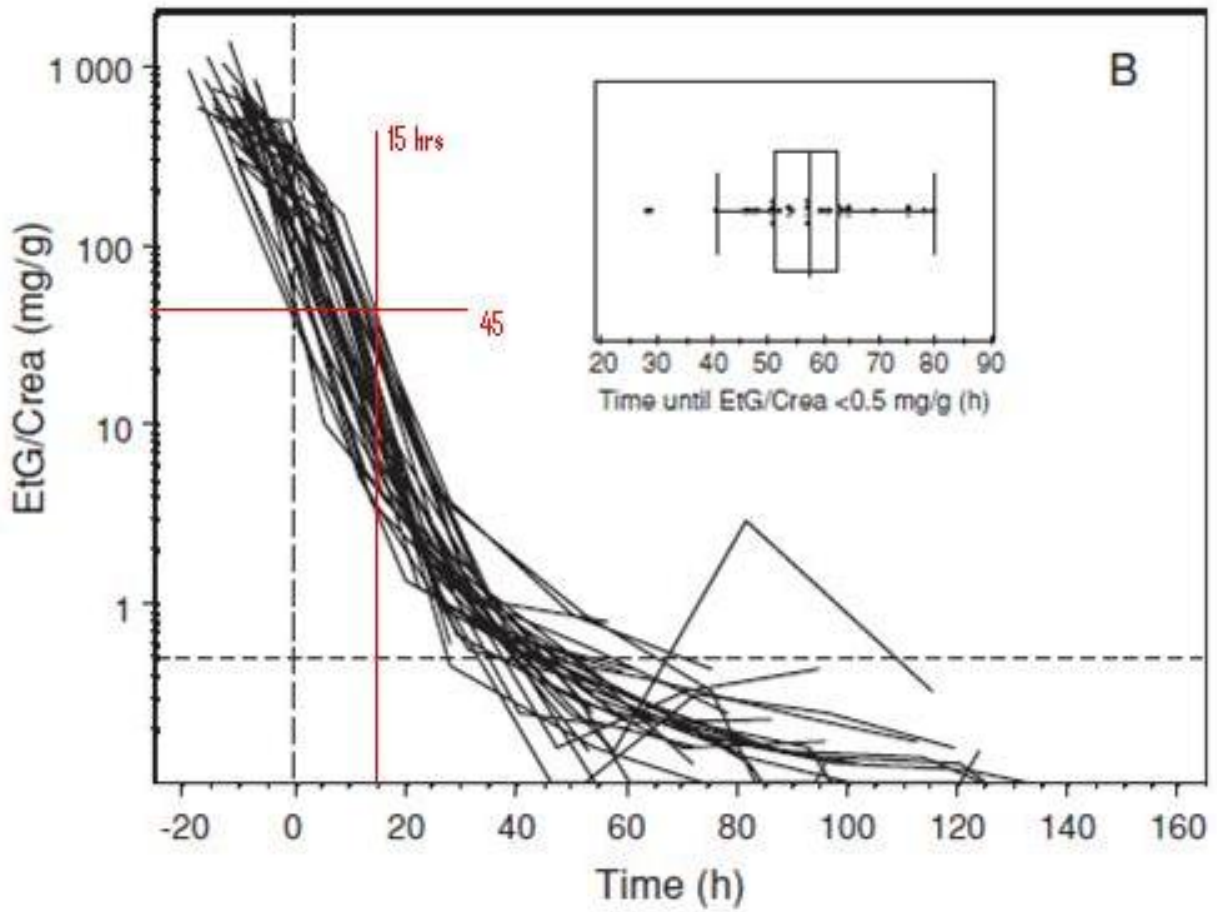
**Hangovers and Traffic Injuries: Is Alcohol's Influence Greater Than Expected?**

- Quantify potential for residual effects ethanol in injured drivers
- Use, ethyl glucuronide (EtG) and ethyl sulfate (EtS) to indicate recent heavy drinking even when blood alcohol is zero.
- Assess biomarkers EtG & EtS in urine

# Initial grant review

- **Lack of information about the time course of the metabolite in at-risk subject samples**
  - no information on how our proposed biomarkers EtG and EtS, performed among chronic drinkers and those with very high BACs.
  - Prior studies restricted to controlled dosing studies
    - only BAC levels up to 100 mg/dl evaluated due ethical concerns.
- Saved by 2 studies of biomarker among those admitted to alcohol withdrawal unit
  - High BACs
  - Elimination EtG in heavy drinkers not differ from health volunteers

***Figure 3. Urinary excretion time profiles for EtG concentrations in relation to the estimated time for a zero ethanol concentration after normalizing the results to urinary creatinine (B) in 32 alcohol-dependent patients during detoxification.*** *Solid red lines represent our proposed residual effects cut-off of 45 mg/L. Inset: Box-and-whisker plots for the times from estimated zero ethanol concentration until urinary EtG/creatinine had returned to below their cut-off limits ( <0.5 mg/g)[3]*

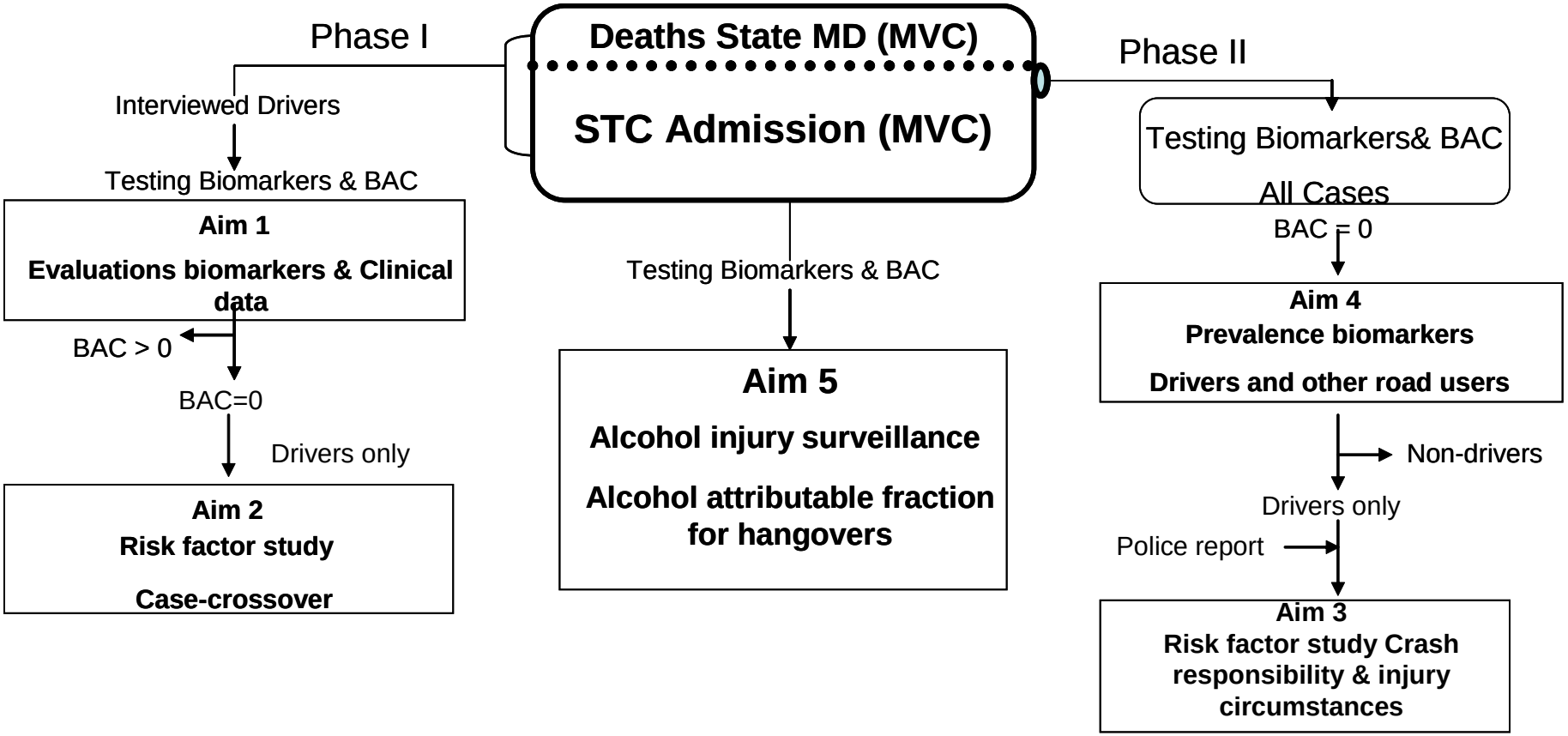



Helander A, Bottcher M, Fehr C, Dahmen N, Beck O. Detection times for urinary ethyl glucuronide and ethyl sulfate in heavy drinkers during alcohol detoxification. Alcohol Alcohol. Jan-Feb 2009;44(1):55-61.

# Methods

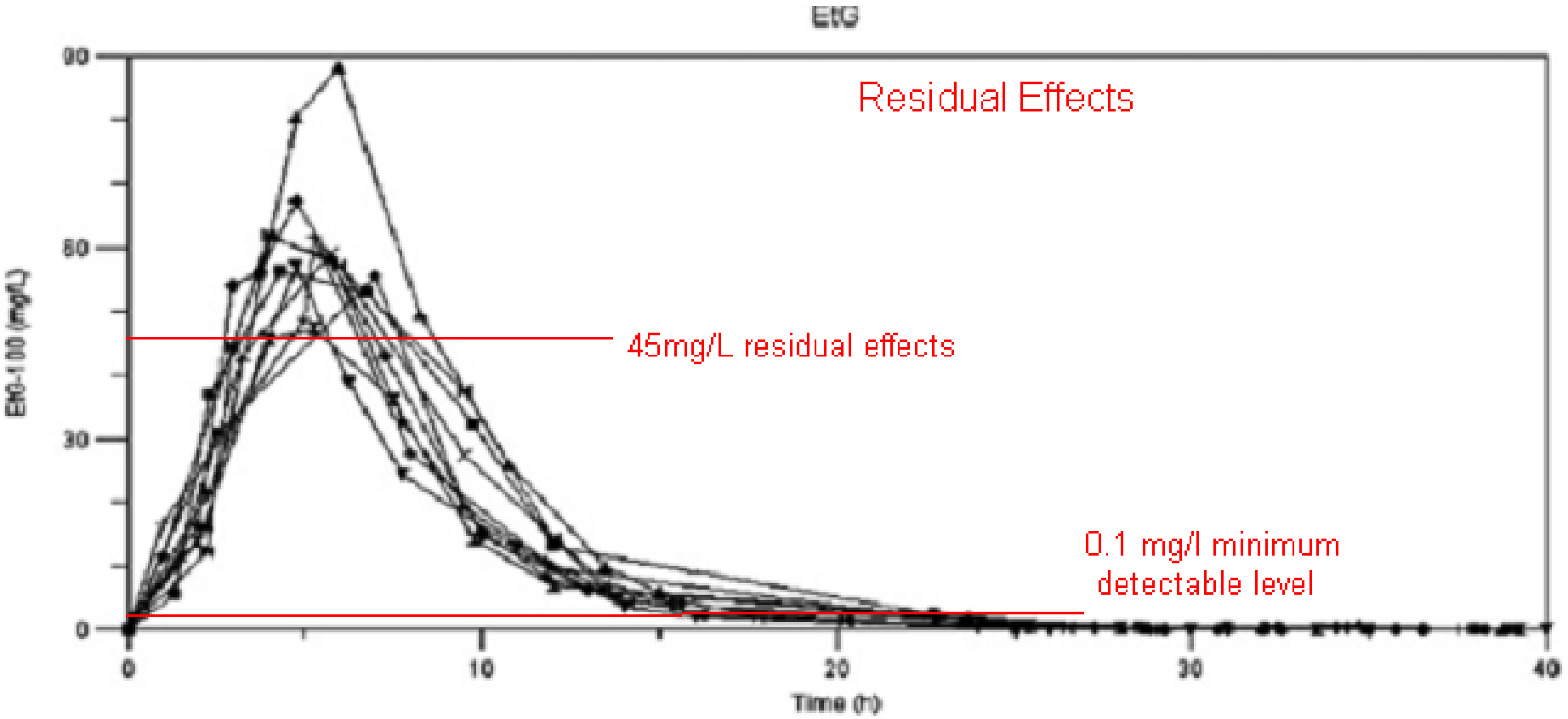
- Admissions drivers to Shock/Trauma UM – Baltimore
- Admissions from all over state of MD
- Only trauma patients
  - Blood alcohol testing all admissions
  - Urine drug screen
- Use urine for EtG and EtS testing
- Deaths for whole state also to be studied- medical examiner

# Hangovers and Traffic Injuries: Is Alcohol's Influence Greater Than Expected? Overview of Study Plan:



# *Individual concentrations of EtG in urine after ingestion of 0.5 g ethanol/kg body weight. Each line represents one subject (n = 10).*






Updated from: Hoiseth G, Bernard JP, Stephanson N, et al. Comparison between the urinary alcohol markers EtG, EtS, and GTOL/5-HIAA in a controlled drinking experiment. *Alcohol Alcohol.* 2008;43(2):187-191.

# Risk estimation

- Case-crossover analyses will provide one estimate of risk
- Compare self-reported drinking 12 hours prior to injury with:
  - Comparable period week before
  - Usual drinking patterns

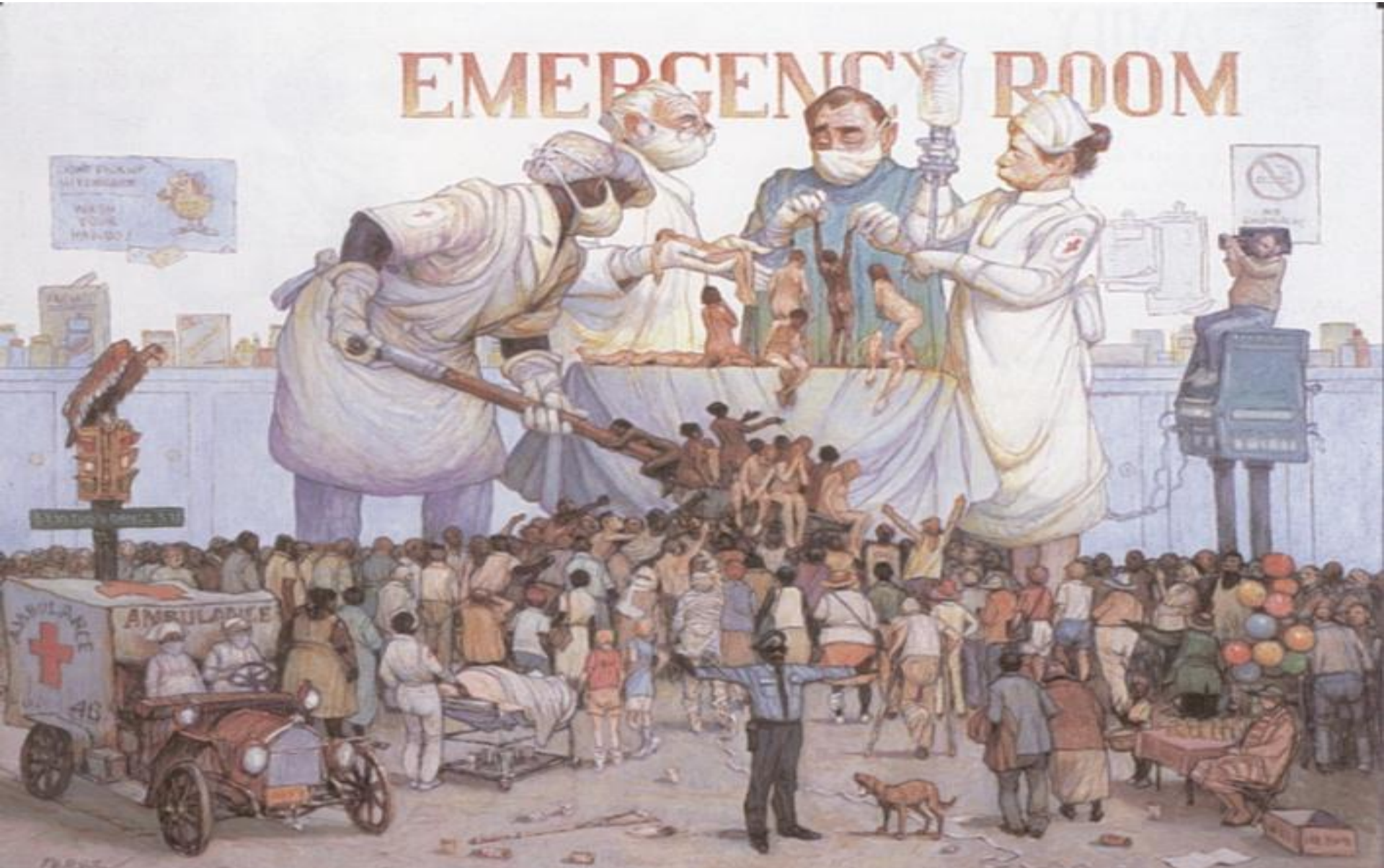
# Risk estimation

- Culpability studies will be used as another estimate of risk
- Determine the extent to which injured zero BAC drivers with biomarker evidence of hangover are responsible for causing their crash, compared with drivers without hangover biomarkers
  - Can include fatalities

# Conclusion

- This study is an innovative use of biomarkers in injury research and may indicate that hangovers are an important but unrecognized risk factor in many injuries.

# Questions and advice



# Questions???


Dr. Gordon Smith

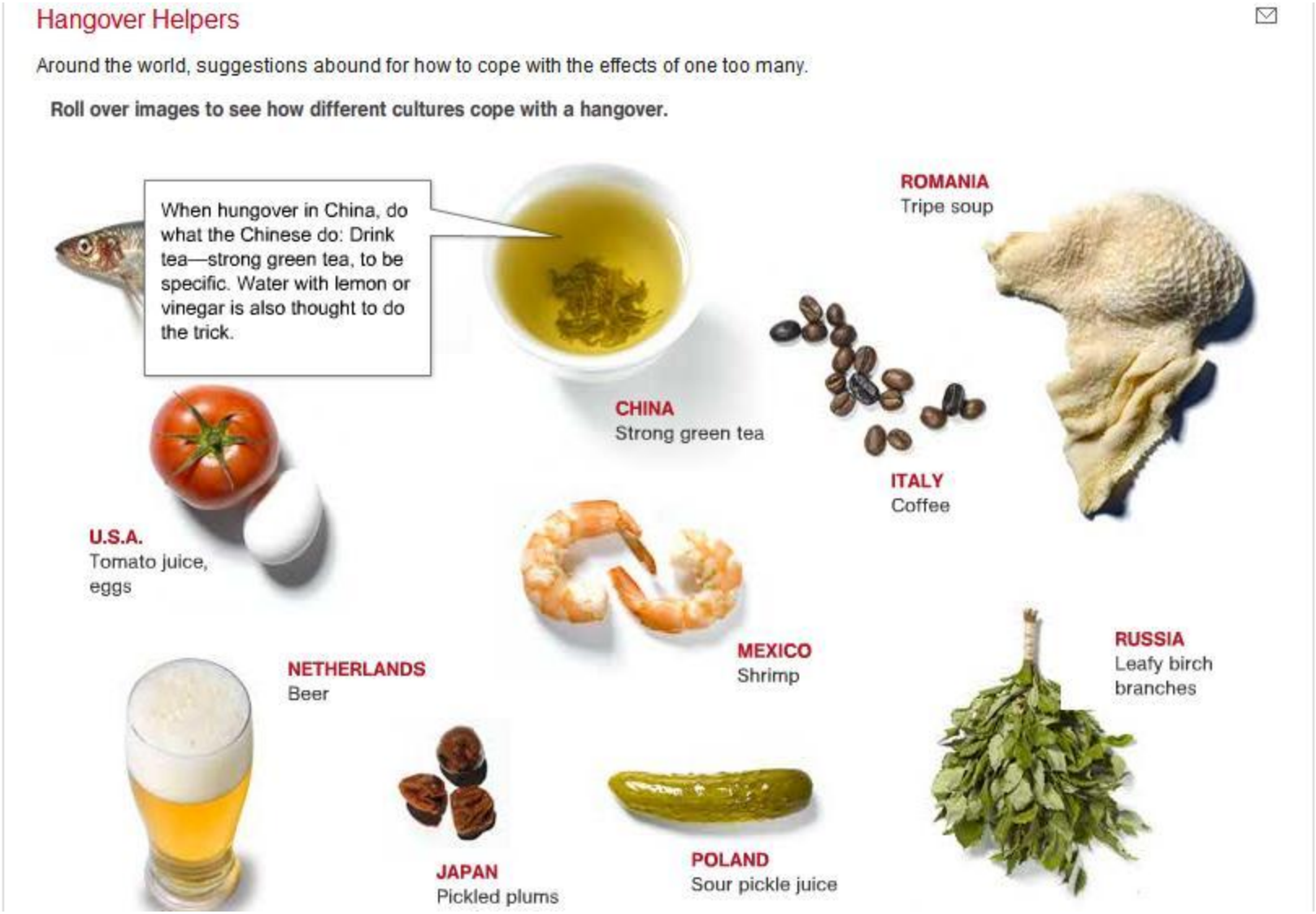
gssmith@som.umaryland.edu

410-328-3847

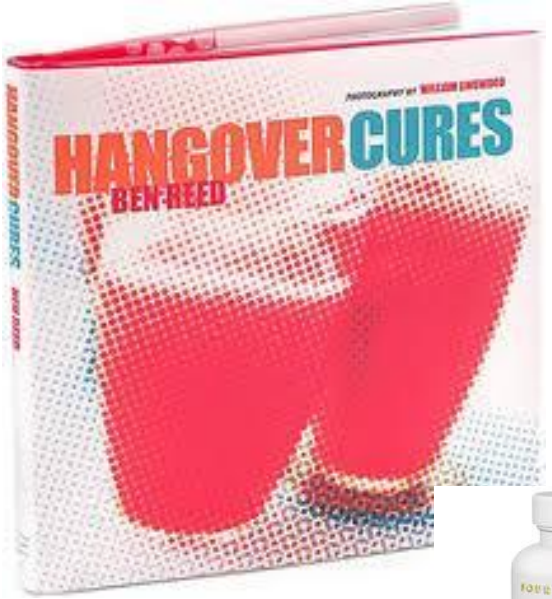

Charles McC. Mathias, Jr.
National Study Center
for Trauma and Emergency Medical Systems

# Hangover Helpers From Around the World

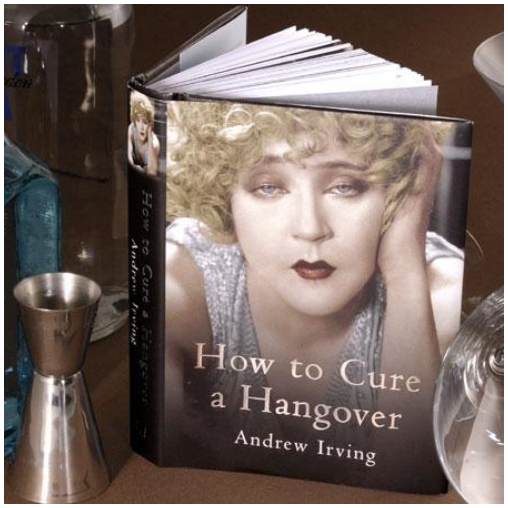
http://ngm.nationalgeographic.com/2009/01/hangover/cures-interactive



# Cures















# The Future

*"You may already be a Nobel Prize winner!"*