

# Alcohol Intoxication and Withdrawal States

Charlie Reznikoff, MD FACP  
Hennepin Healthcare

# You should know...

1. The unique metabolism of alcohol  
The relevance of alcohol binges
2. Metabolic disturbances from alcohol ingestion
3. Alcohol withdrawal syndromes

# 1. Alcohol metabolism and tolerance



**POLL**

What is the half life of alcohol?

A. one hour

B. two hours

C. four hours

**D. none of the above**

Alcohol has zero order kinetics

*All other drugs have first order kinetics*

First-order vs. Zero-order kinetics

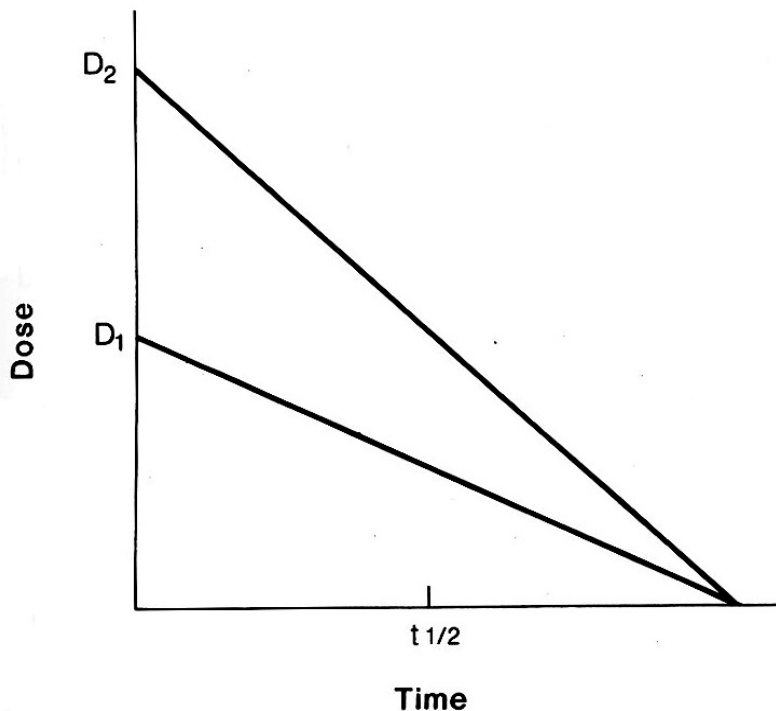


FIGURE 3.1: First-Order Kinetics

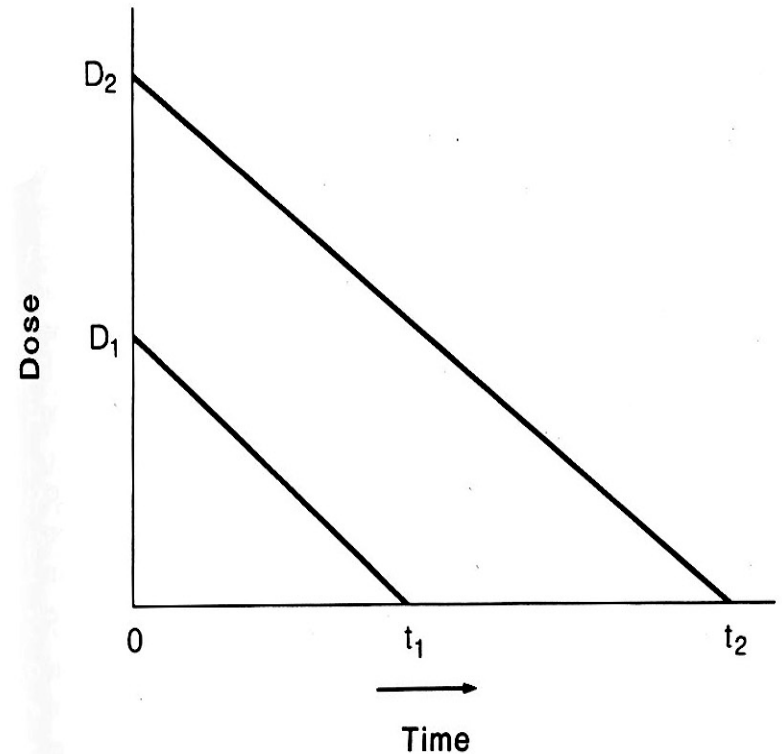
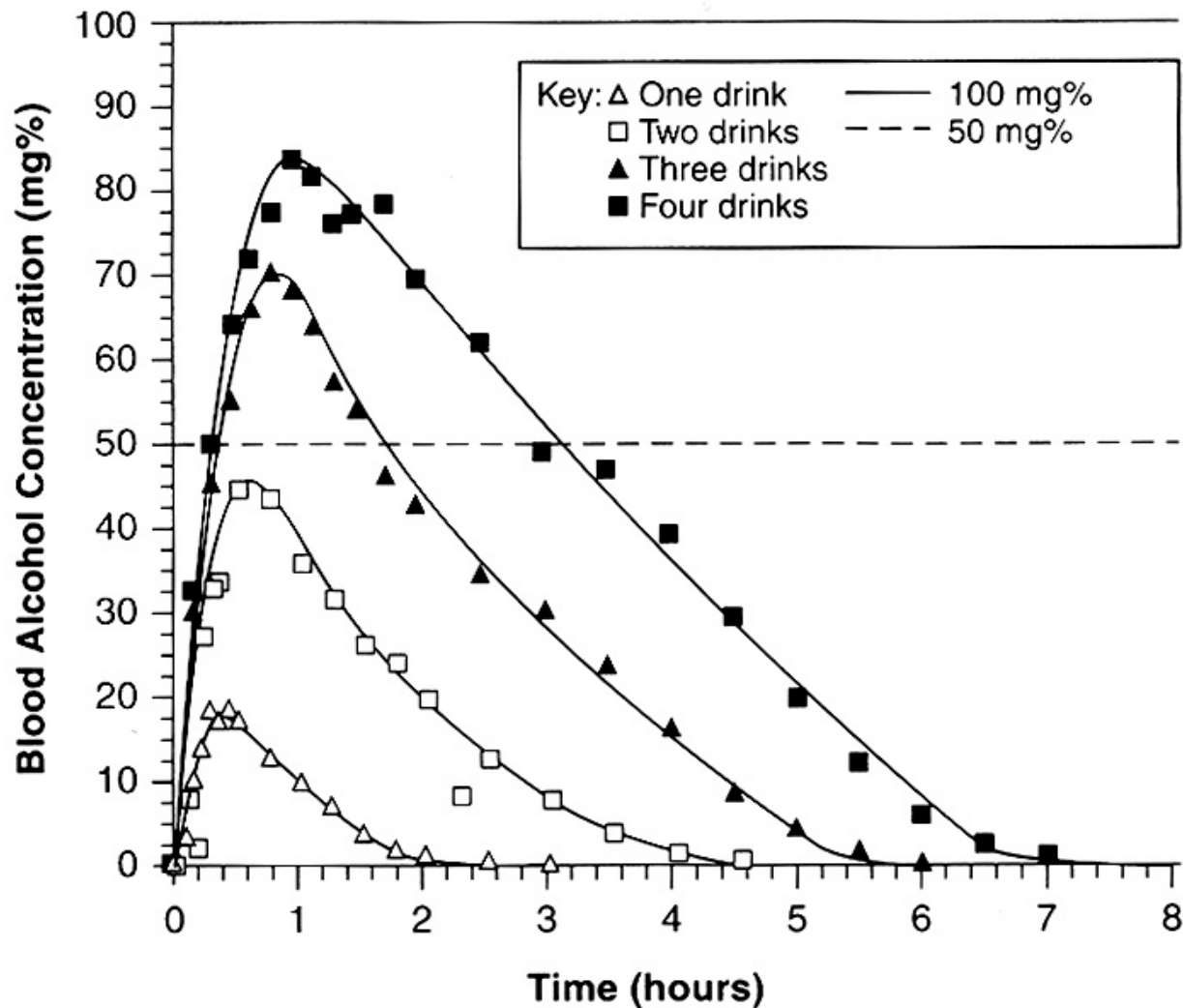


FIGURE 3.2: Zero-Order Kinetics



Blood alcohol concentration (BAC) after the rapid consumption of different amounts of alcohol by eight adult fasting male subjects.\* (Adapted from Wilkinson et al., *Journal of Pharmacokinetics and Biopharmaceutics* 5(3):207–224, 1977.)

100 mg% is the legal level of intoxication in most States. 50 mg% is the level at which deterioration of driving skills begins. (*JAMA* 255:522–527, 1986.)

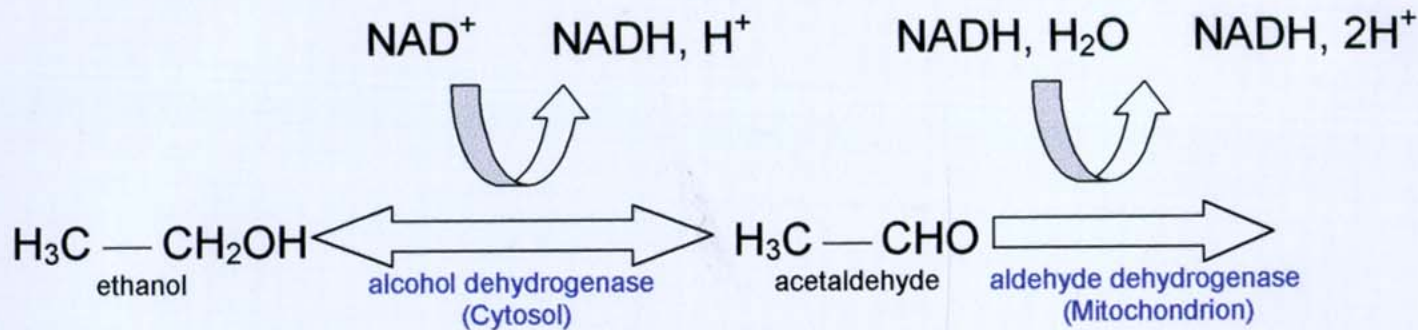
\*If the same number of drinks are consumed over a longer period of time, BAC's will be lower.



**POLL**



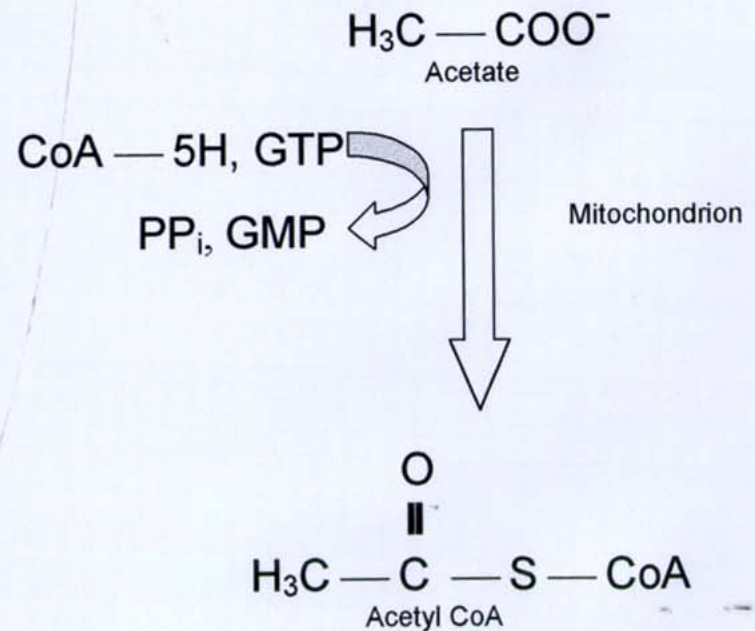
**True/False:** Tolerance to alcohol occurs primarily because the liver upregulates enzymes.



*These enzymes upregulate by <10% in alcoholism*

In fact, cirrhosis may cause sensitization to alcohol

*the relative efficiency of alcohol and aldehyde dehydrogenase predict susceptibility to alcoholism*



# Variables Determining of BAL

- **Body water volume (muscle mass)**
- **Genetics**
  - Enzymatic activity of alcohol metabolism
- **Speed of consumption and absorption**
  - Temperature of beverage
  - Presence of food in stomach
  - Body position
  - Carbonation

A 16 year old 170 pound boy...

has about the same trajectory of  
alcohol blood levels as...

a 60 year old 170 pound man  
(assuming similar genetics and consumption  
patterns).

# How does tolerance occur?

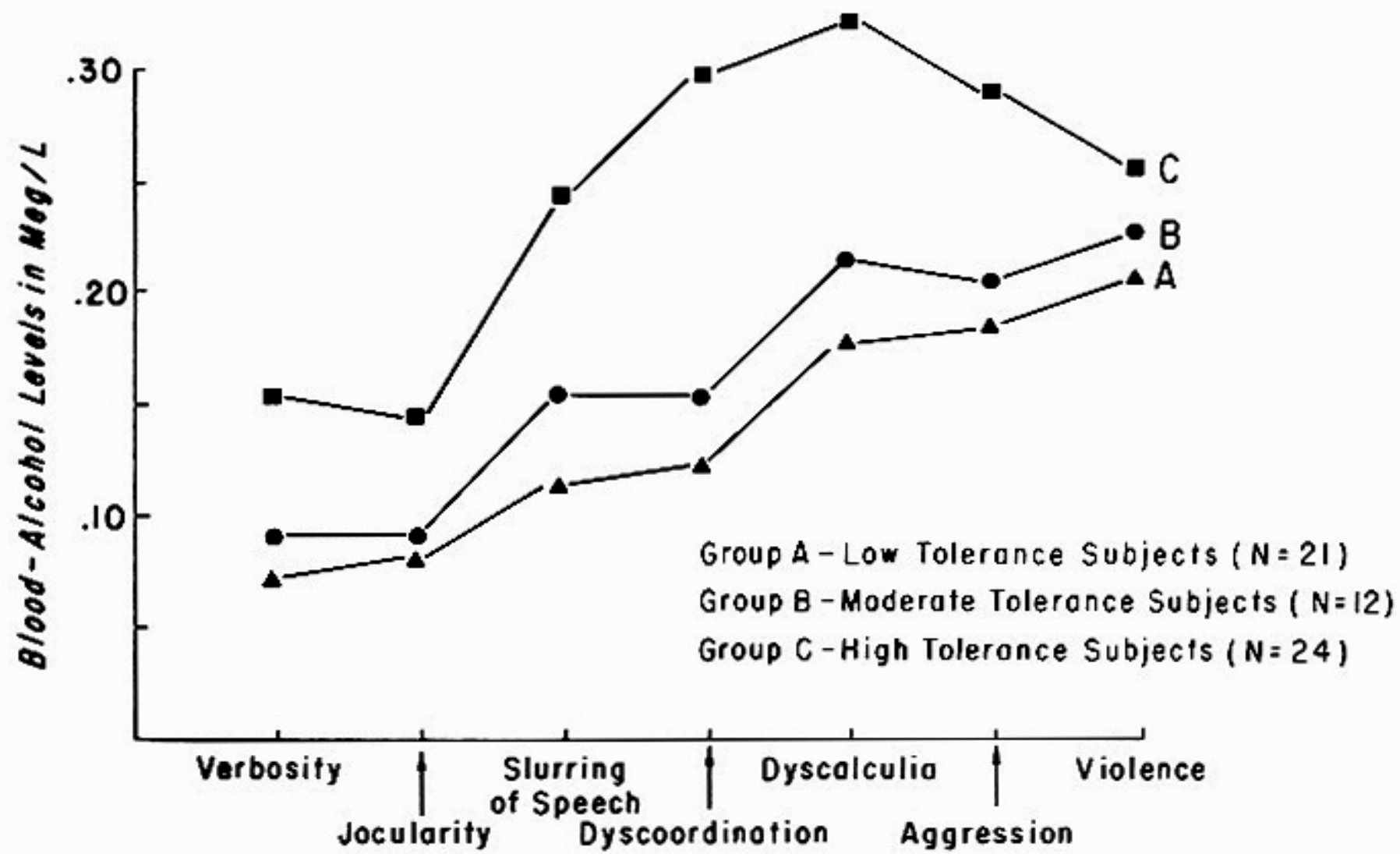
- The brain adapts to the presence of alcohol
- The brain develops mechanisms to slow itself down and act deliberately



**POLL**

All of the following occur with intoxication.  
To which does a person develop the least tolerance:

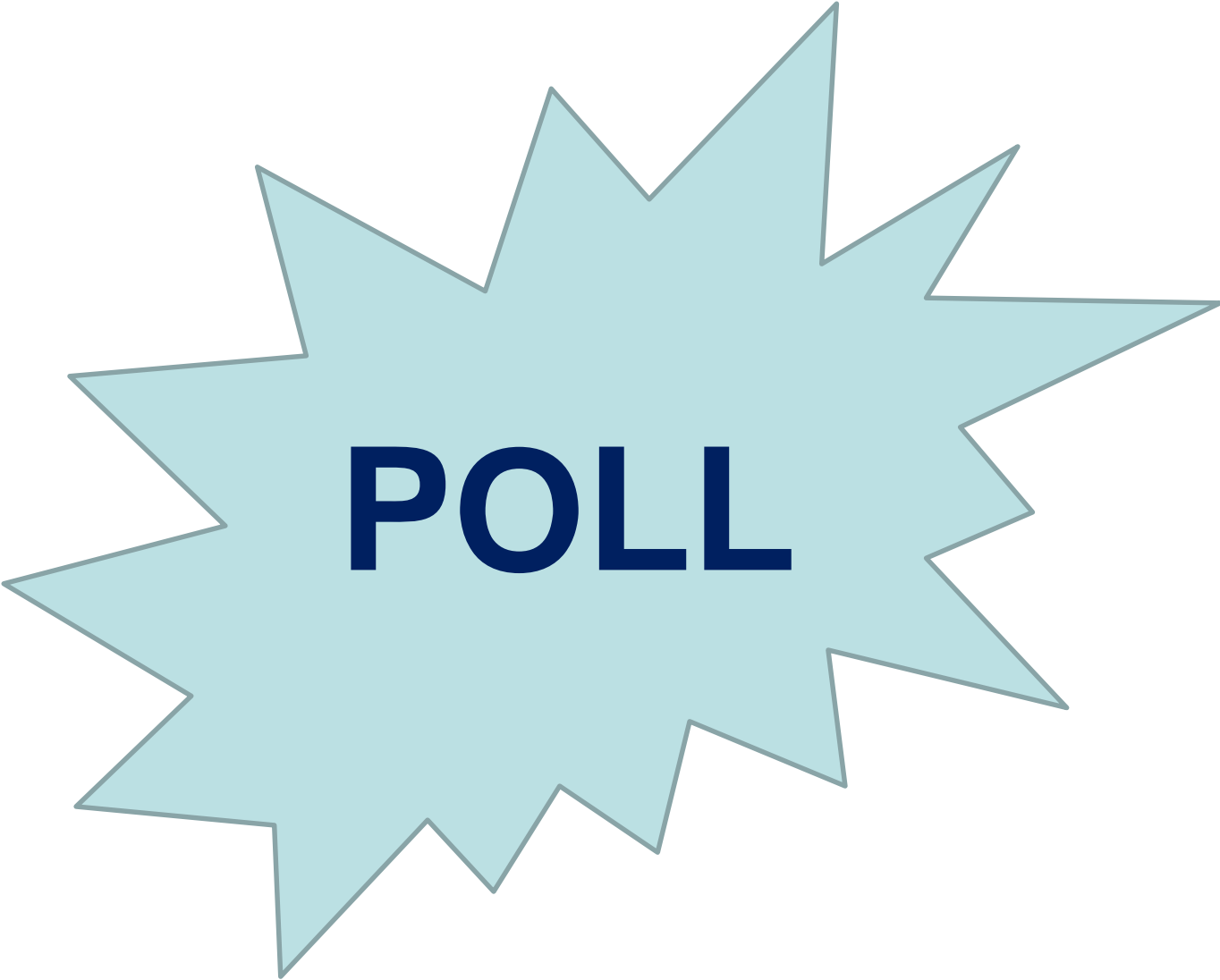
- A. impaired motor coordination
- B. slurred speech
- C. violent behavior**
- D. difficulty making simple calculations



**FIGURE 5**

**Behavioral Manifestations of Alcohol as a Function of Blood-Alcohol Levels in Low, Moderate and High Tolerance Groups**





**POLL**

**True/False:** There is a linear increase in serious accidents associated with increasing BAL.



**POLL**

Alcohol does which:

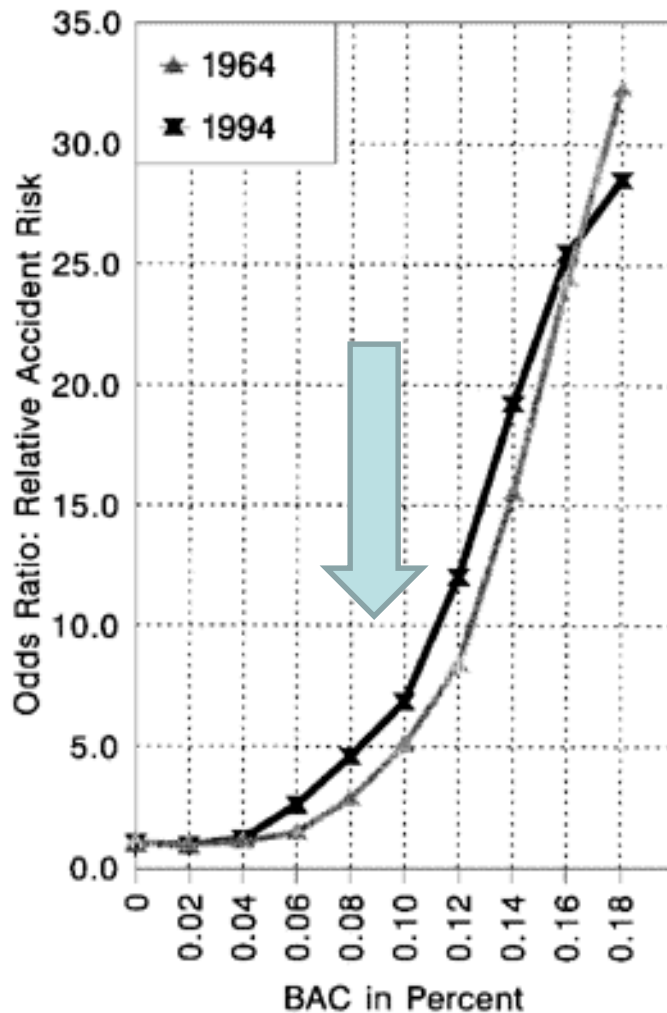
A. increase suicidal thoughts

**B. increase suicidal actions**

C. both

D. neither

# Blood Alcohol and Probability of Accident



Tolerance shifts the curve to the right

Inexperience shifts it to the left

To get over BAL 0.1 you need to “binge”

## 2. Metabolic and nutritional effects of alcohol consumption

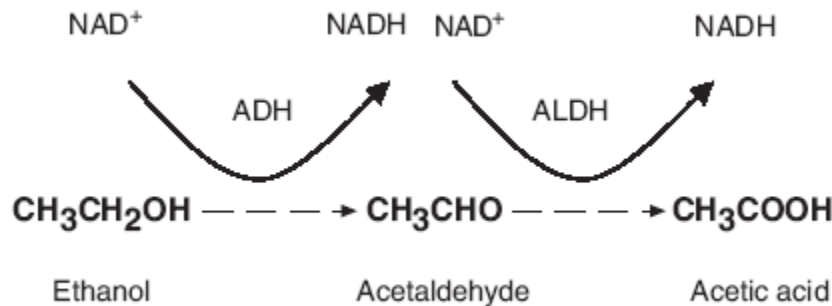
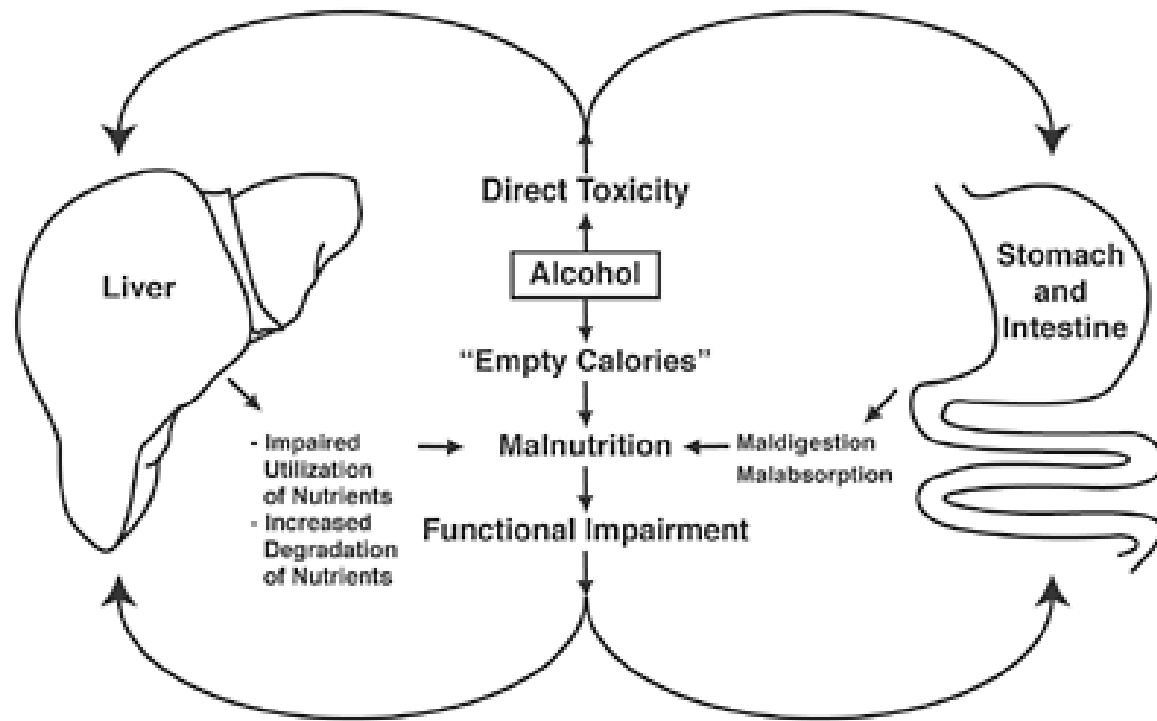


**POLL**

**True/False:** alcoholic ketosis  
is starvation ketosis



Alcoholic ketosis is starvation ketosis complicated by build up of acidic alcohol metabolites



Alcohol gums up the metabolic machinery (NAD/NADH) needed to mobilize glucose from the liver

# Alcoholic Ketosis

- Low carbohydrate intake puts the body in a catabolic state
- Decreased gluconeogenesis due to alcoholic hepatitis
- Increased acid load to the body due to byproducts of alcohol and anaerobic metabolism blockades sugar mobilization

# Alcoholic Ketosis

- Elevated anion gap
  - Hypovolemia and anaerobic metabolism lead to lactic acidosis
  - Ketones from alcohol breakdown
    - Beta-HO-Butyrate predominates
    - This is not the ketone reported on U/As
- Acidosis commonly severe ( $\text{HCO}_3^- < 10$ )
- Metabolic alkalosis from emesis possible

# Alcoholic Ketosis

- Give fluids with dextrose
- Elevated anion gap very common in acute and recent alcohol intoxication
- Consider other causes of anion gap when kidney malfunction present:
  - Ethylene glycol
  - Methanol ingestion
  - Salicylate ingestion

# Hypoglycemia in alcoholic diabetics

- Multifactorial: med compliance, nutrition, liver disease, acid/base balance
- Hypoglycemia unresponsive to glucagon
- Often requires IV dextrose
- May have severe hypokalemia

# Remember: he is malnourished!



People who drink a case of beer daily (more than 3000 calories) gain weight without eating any food. They are profoundly malnourished and at risk of vitamin and electrolyte abnormalities.

“How many meals do you eat per day?”

“What do you eat?”

# Watch lytes, give multivitamin

- Thiamine
  - Wernicke's probably more common than new think
- Potassium
  - will fall w/correction of acidosis
- Phosphorous
  - will fall with refeeding
- Magnesium
  - needed for K<sup>+</sup> replacement
- These may be persistently low, as in refeeding syndrome



# Alcoholic transaminitis

- AST/ALT >2
- AST absolute value <500
- Take note of TRUE “liver function” tests
  - Bilirubin
  - Albumin
  - INR
  - Plts

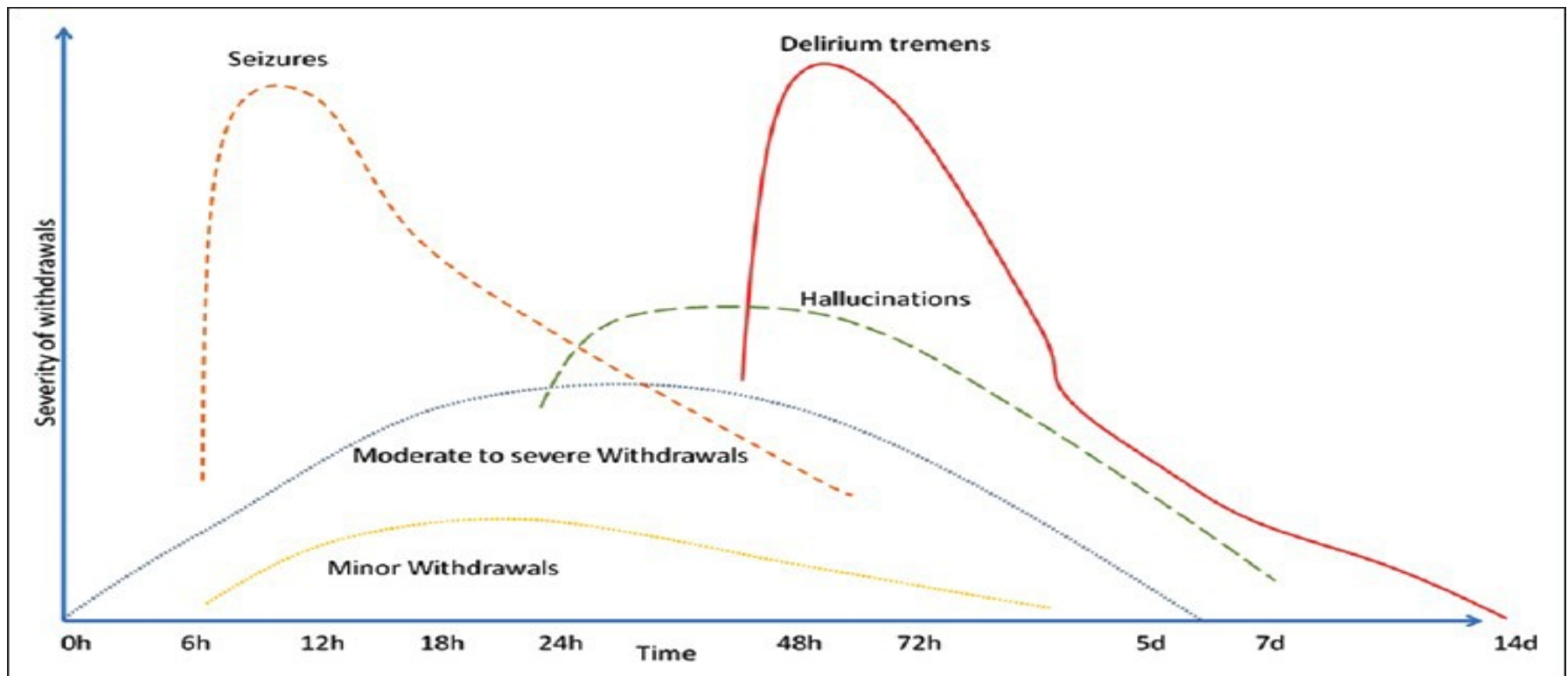
# Role of GGT

- GGT Rarely used anymore
- The HBA1C of alcohol
- Get a baseline sober GGT level
- Rule out other causes of liver/biliary irritation
- GGT increase indicate alcohol consumption over weeks

# Alcohol withdrawal is not one thing!

Differentiate prior/expected mild withdrawal from patients with:

- Past serious withdrawal including delirium or seizure
- Age >50 or concomitant medical issues (pneumonia)
- Severe malnutrition, alcohol only source of caloric intake



# Outpatient alcohol withdrawal treatment for low risk people

- No benzos!
- Gabapentin 300 TID, increase to 600 if needed
  - Taking at night sometimes preferred
  - Continue ongoing after detox complete
- Clonidine 0.1 TID for 7-10 days
- Multivitamin
- Nutrition

# Summary

- DRINK SLOWLY WITH FOOD
- Alcohol binges high risk for accidents and metabolic disturbances
- People with DM type 1 need to be very careful w alcohol
- Alcohol causes acid/base, electrolyte, vitamin and liver issues
- Outpatient tx of mild alcohol wd is a thing!

Thank You!  
Questions?