Retrograde Analysis & Other Rule 702 Challenges

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What is a Retrograde Extrapolation?

A scientific approximation or mathematical modeling of a person's blood alcohol concentration at an earlier time after the cessation of drinking.

What are the types BAC extrapolations?

- Backward BAC extrapolations (retrograde calculations) – going back in time to approximate a blood alcohol concentration
- Forward BAC extrapolations (anterograde calculations) – going forward in time to approximate a blood alcohol concentration

Other BAC Extrapolation Terms

- **White's Retrograde Calculation –** unabsorbed drinks are subtracted from a chemical test result to render a BAC below the per se level
- **Speculative Retrograde Calculation –** no qualified assumptions stated nor known particulars employed, adding to a post-event alcohol test result the product of a time interval with an assumed elimination rate

What Facts are Needed From a Prosecutor?

- It depends on situation
- To time of incident – a thorough drinking history from subject
  - History should include: (1) No alcohol consumption between time of incident & time of test, (2) BAC above 0.020%, (3) elimination rate of subject, (4) when subject began drinking, (5) time of last drink, (6) number of drinks, (7) type of drinks, (8) rate of drinking & (9) food (amount, type, when)

What Facts are Needed From a Prosecutor?

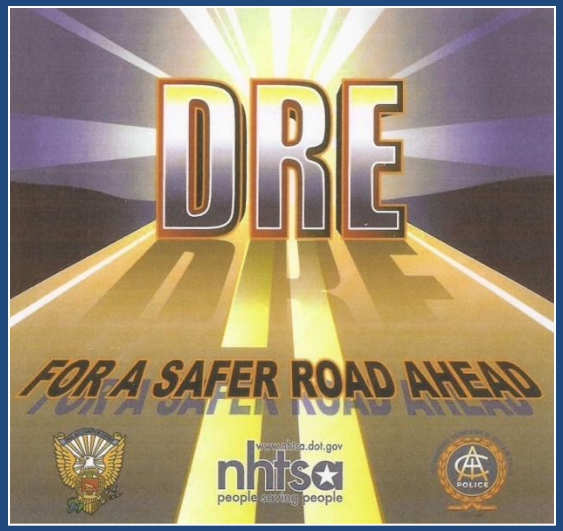
- If State Uses Time of Test Law (2 hour rule)
  - Criminalist needs are reduced but qualified assumptions <u>must</u> be stated to jury
  - Need: (1) Absolute knowledge that no alcohol consumption between time of incident and time of test, (2) time of incident, (3) time of chemical test, (4) BAC above 0.020%

You Received a Rule 702 Challenge – Now What?

First Consideration
Does Rule 702 Apply?

- Retrogrades, HGN, Blood Testing, Opinions
  - Yes
- FSTs
  - No
    - *State v. Superior Court* (*Blake*, RPI), 149 Ariz. 269 (1986); *State ex rel. McDougall v. Ricke*, 161 Ariz. 462 (App. 1989); *State ex rel. Hamilton v. City Court* (*Lopresti,* RPI), 165 Ariz. 514 (1990).
- Phlebotomy ?
- NHTSA Cues – only if quantify during trial
- Breath Testing – not if using the statute
    - *State ex. Rel. Collins,* (*Deason,* RPI)

Do Not Concede Rule 702 Applies to Entire DRE Protocol



See, State v. Daly, 278 Neb. 903, 775 N.W.2nd 47 (2009).

Rule 702 -*"Daubert"* Rule

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

- (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
- (b) the testimony is based on sufficient facts or data;
- (c) the testimony is the product of reliable principles and methods; and
- (d) the expert has reliably applied the principles and methods to the facts of the case.

Proponent's Burden

- Establishing that the pertinent admissibility requirements are met by preponderance of the evidence.

Bourjally v. United States, 463 U.S. 171 (1987).

Rule 702
5 Parts of the Rule

- "A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:"
  - #1 must qualify witness as an expert
  - Thoroughly qualify your witness
    - Especially officers
    - DREs should have CVs

5 Portions of Rule 702 #2

- "a) The expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue"
  - Does the subject embrace scientific, technical, or other specialized knowledge?
  - If so = relevance
  - Subject to Rule 403
    - Specific to the case
    - Should not confuse it

5 Portions of Rule 702 #3

- b) The testimony is based on sufficient facts or data
  - Factual basis for opinion
    - Have expert explain basis for opinion
  - Should relate to case at bar
  - Can opinion, reasoning or method be properly applied to facts in issue?

Why Can Experts Retrograde to Within the 2 Hour Window Without a Full Drinking History?

- Because the 2 hour time of test law sitting in front of the retrograde time interval compensates for many variables
- Variables compensated for: When subject began drinking, when last drink was consumed, number of drinks, type of drinks, rate of drinking & food (in most cases)
- How?

Why Can Experts Retrograde to Within the 2 Hour Window Without a Full Drinking History?

- Current Relevant Scientific Literature Shows:
  - Vast majority of people reach peak blood alcohol concentration within 2 hours of last swallow of alcohol regardless of:
    - When drinking began, time of last drink, number of drinks, type of drinks, rate at which they drank or food eaten while drinking

Why Can Experts Retrograde to Within the 2 Hour Window Without a Full Drinking History?

- Vast majority of people does not mean all people
- Exceptions would be a minority of people who ate very large amounts of food while drinking <u>along with smoking</u>
- Large amount of food along with alcohol can cause an extended plateau with the blood alcohol concentration curve – A biphasic absorption pattern

Why Can Experts Retrograde to Within the 2 Hour Window Without a Full Drinking History?

- Extended plateau outside of 2 hours is rare but can happen & make retrograde extrapolation non-applicable
- In all studies looking at large amounts of food consumed while drinking, <u>all subjects</u> achieved 80% of peak BAC quickly within 2 hours of last swallow of alcohol

Why Can Experts Retrograde to Within the 2 Hour Window Without a Full Drinking History?

- Knowing vast majority of people will be in the post-peak phase of blood alcohol concentration curve within 2 hours of last drink - *largest single assumption*
  - Along with no alcohol consumption between time of incident & time of test
  - BAC result above 0.020%
  - Use a range of elimination rates (non-drinker, social drinker & chronic drinker)

Why Can Experts Retrograde to Within the 2 Hour Window Without a Full Drinking History?

- A retrograde calculation can be applied, adding the smallest interval of time to not risk over estimating a subject's BAC, to just within the 2 hour window
- Based on current relevant literature, the retrograde calculation will most likely underestimate subject's BAC

5 Portions of Rule 702 #4

- c) The testimony is the product of reliable principles & methods
  - Similar to *Frye* (accepted in relevant scientific community) – Lay *Deason* foundation +
  - Non-police world also
    - DRE & HGN (medical field)
    - LIDAR (NASA)
  - Suggest use studies
    - Ask officer/witness first
  - Officer's accuracy rating & <u>personal experience</u>

5 Portions of Rule 702 #4 (cont.)

- c) The testimony is the product of reliable principles & methods
  - Case law should assist (HGN, retrogrades, blood testing, etc.)
    - Can't rely only on *Frye* cases or out-of-state
  - Focus on <u>principles & methodology</u>
    - Not conclusions they generate
  - Consider using for objections
    - Microclots
    - Statistical stacking
    - Steepling
    - ETC.

Relevant Studies & Scientific Principles Supporting Retrogrades

- **Journal Articles:** Relevant Studies Scientific Principles Support Retrogrades.docx

- **Text books to have:**
  - *Wigmore on Alcohol: Courtroom Alcohol Toxicology for the Medicolegal Professional* -By James G. Wigmore
  - *Garriott's Medicolegal aspects of Alcohol* -5th Edition, Edited By James C. Garriott

Helpful Case Law

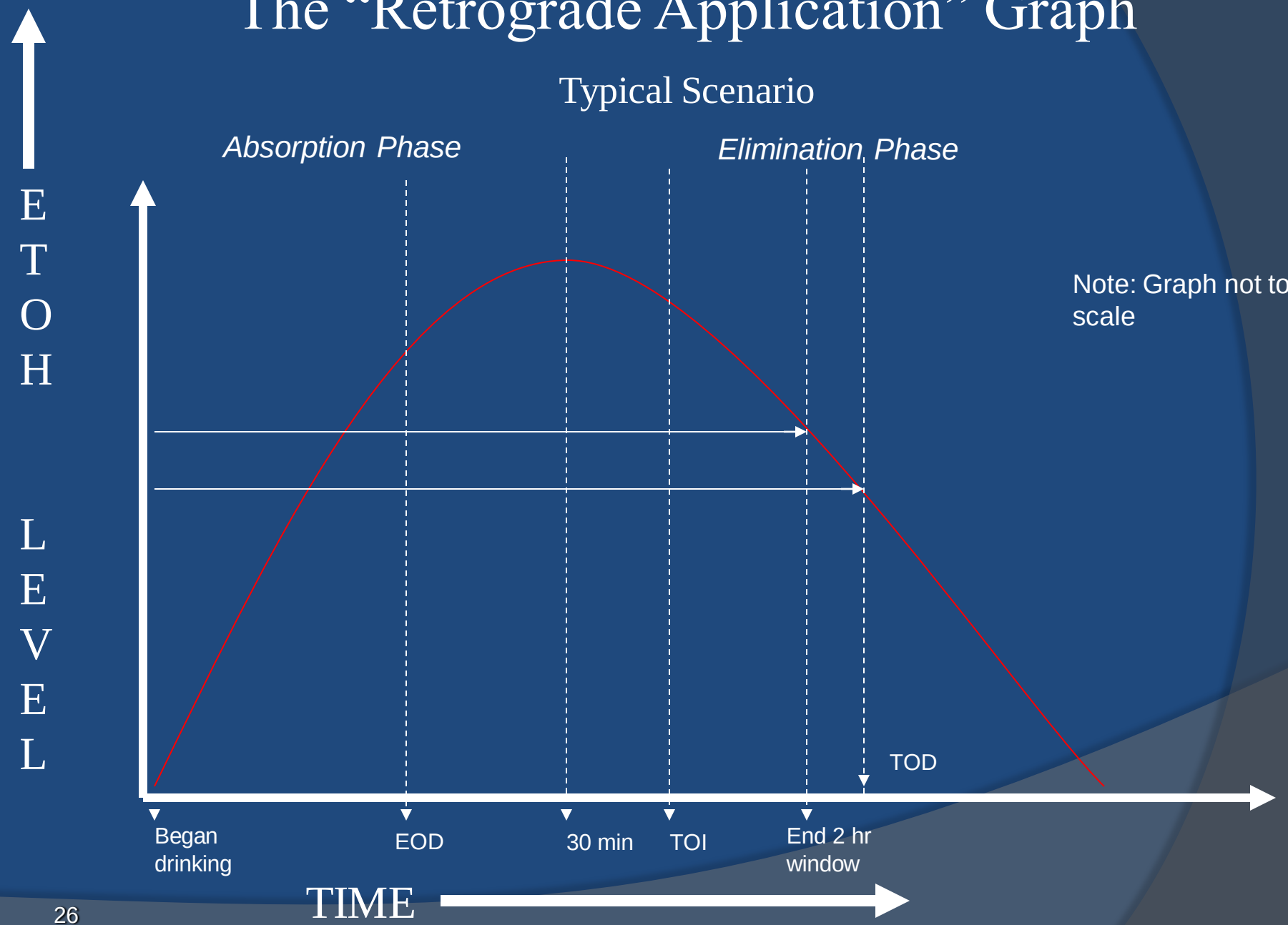
- *Ring v. Taylor*, 141 Ariz. 56 (App. 1984); *Desmond v. Superior Court*, 161 Ariz. 522 (1989); *State v. Claybrook*, 193 Ariz. 588 (App. 1998); *State v. Root*, 193 Ariz. 442 (App. 1998); *O'Neill v. Superior Court* (*Kankelfritz*, RPI), 187 Ariz. 440 (App. 1996); *State v. Garcia,* 165 Ariz. 547 (App. 1990); *State v. White,* 155 Ariz. 452 (App. 1987); *State v. Superior Court*, (*Klemenic,* RPI), 170 Ariz. 474 (App. 1991).

- *State v. Burgess,* 5 A.3d 911, 2010 VT 64 (Vt. 2010); *State v. Smith,* 942 So.2d 308 (Miss.App. 2006); *Lepine v. State,* 10 So.3d 927 (Miss. App. 2009).

5 Portions of Rule 702 #5

- d) the expert has reliably applied the principles and methods to the facts of the case.
  - Case specific
  - Did this witness do it correctly – to a point
    - Focus is on principles & methodology
  - Again officer's accuracy rating (logs) assists
  - Accepted technique was properly applied & results accurately recorded

The "Retrograde Application" Graph



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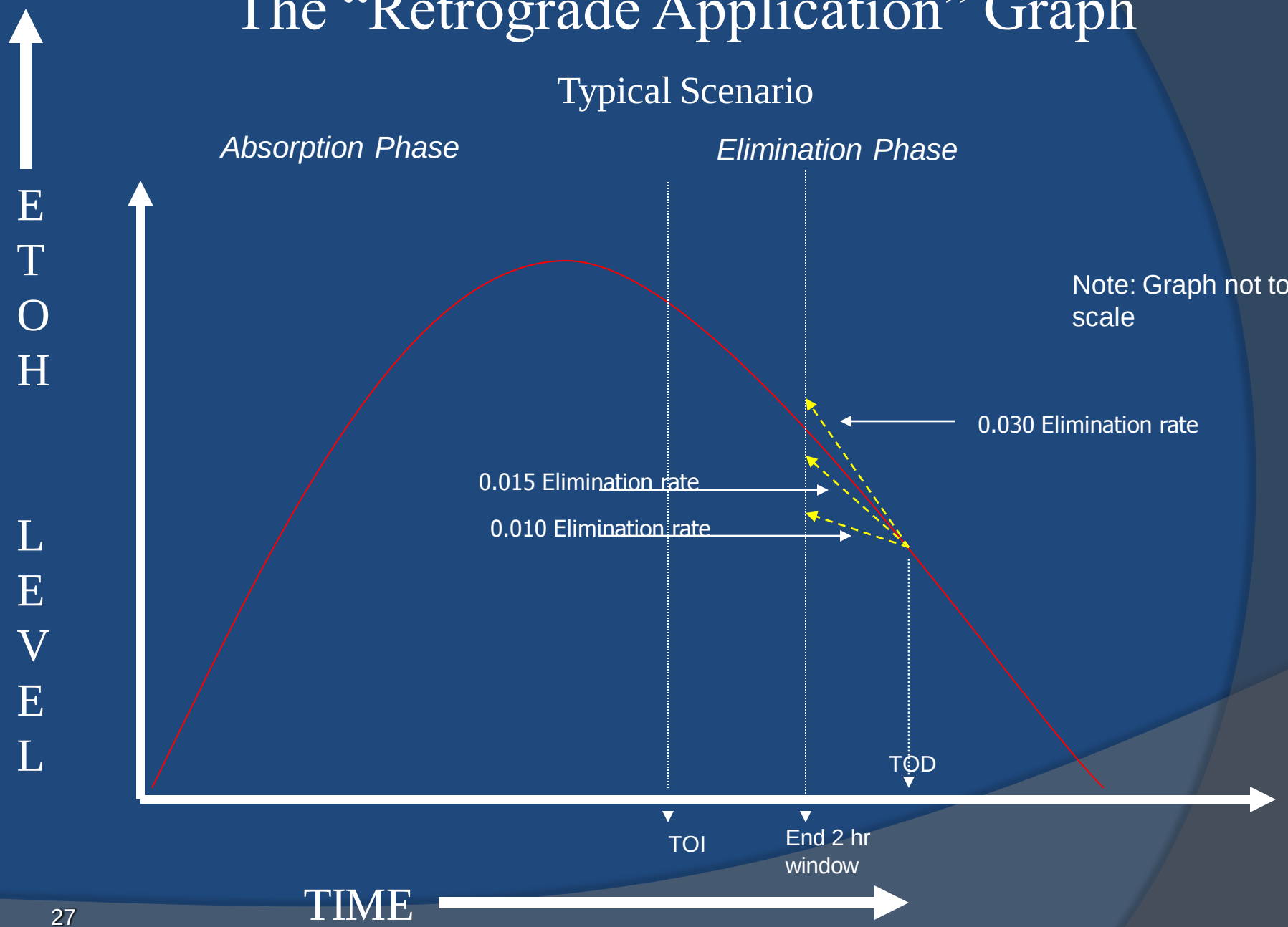

Meeting Defense Challenges

- Dubowski's 1985 article " and Elimination of Alcohol: Highway Safety Aspects"
  - One of the most commonly cited articles to argue why a retrograde calculation cannot be performed
  - A review of literature of the time
  - Dubowski quote pg 106: "Finally, no forensically valid forward or backward extrapolation of blood or breath alcohol concentration is ordinarily possible in a given subject and occasion solely on the basis of time and individual analysis results"
  - Why?

Meeting Defense Challenges

- 2 Main Points Often Referred to in Article:
  - **(1)** Dubowski said peak-BAC time can vary from 14-138 minutes, average being 42-57 minutes
  - Because Dubowski said 138 minutes to reach peak-BAC is possible, this is outside 2 hour window, so no retrograde can be applied in the defenses opinion
  - A slow time to reach peak-BAC is rare, edge of the Gaussian Distribution Curve (Bell Curve), is not typical
  - Remember : slow peak-BAC times are associated with biphasic absorption pattern, a rapid steep rise in BAC (80% of peak achieved quickly) followed by slowly rising extended plateau
  - Biphasic absorption patterns are indicative of alcohol being trapped in large amount of food

Meeting Defense Challenges

- 2 main points often referred to in article:
  - (2) ‘short-term’ fluctuations from trend line in breath alcohol curves
  - ‘Short-term’ fluctuations are often referred to as ‘steepling’
  - Because the graphs in Dubowski’s review demonstrated steepling Analysis Dubowski graphs 1985-Absorption distribution elimination EtOH article.pdf

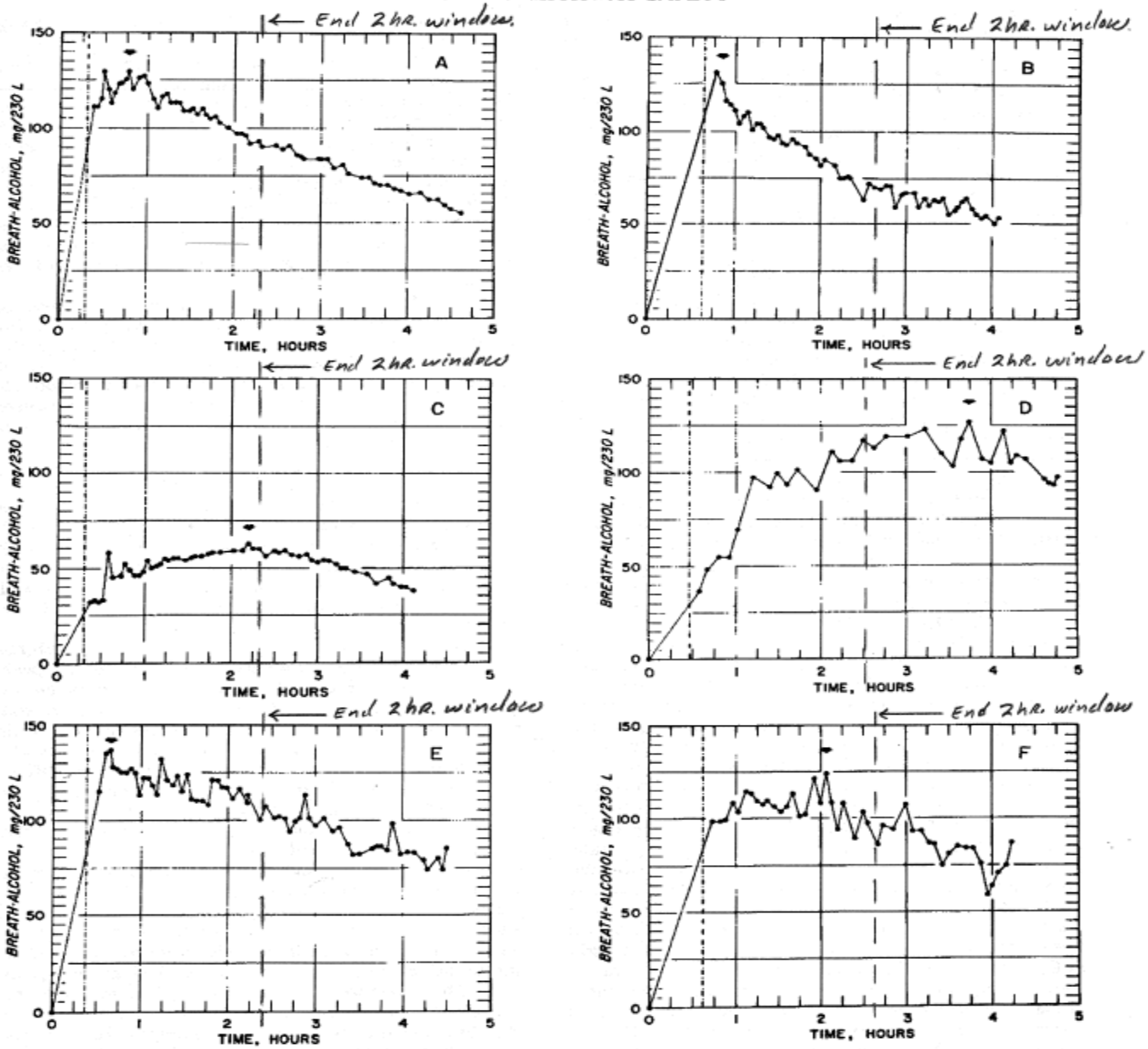

FIGURE 2. Experimental human breath alcohol curves showing a typical Widmark pattern (2A) and various anomalies and short-term breath alcohol fluctuations (2B–2F). Each plotted point represents a separate breath alcohol measurement in g/230 L. The dotted line near the left ordinate indicates the end of alcohol ingestion. The arrow shows the apparent peak breath alcohol concentration at least 15 min. after the end of alcohol ingestion.

Meeting Defense Challenges

- 2 Main Points Often Referred to in Article:
  - (2) cont. Dubowski said unpredictable nature of breath alcohol curves makes retrograde extrapolations impossible
  - Steepling has been demonstrated to be an artifact of <u>improper testing methodology,</u> not a real human pharmocokinetic phenomenon on elimination side of blood alcohol concentration curves
  - Some of Dubowski's opinions in article are based on bad graphical data

Meeting Defense Challenges

- Dealing with Dubowski's Statements About not Being Able to do Retrograde Calculations
  - Article was written in 1985, retrogrades then were to time of incident, no time of test laws were in place
  - Dubowski was member of National Safety Council subcommittee on Alcohol and Other Drugs which advocated for time of test laws to be adopted by state governments Scientific Soundness of Time-of-Test Laws.pdf
  - 32 States, district of Columbia & Canada have adopted time of test laws

Meeting Defense Challenges

- Dealing With Slow Peak-BAC Time Arguments
  - Know first 4 Jones articles from Absorption, Elimination and Peak-BAC Time list Relevant Studies Scientific Principles Support Retrogrades.docx
  - Remember, people who display slow peak-BAC time, are rare, ate a lot of food just before or during drinking, may have smoked during drinking & ALL achieve 80% of peak-BAC quickly after cessation of drinking
  - Also in studies in which large amounts of food were eaten while drinking, most subjects achieved peak-BAC within 2 hours after cessation of drinking

Relevant Studies & Scientific Principles Supporting Retrogrades

- **Absorption, Elimination, Peak BAC Time**
  - "THE COURSE OF THE BLOOD-ALCOHOL CURVE AFTER CONSUMPTION OF LARGE AMOUNTS OF ALCOHOL UNDER REALISTIC CONDITIONS" Jones, Wigmore, House; Can. Soc. Forensic Sci. J. 2006.
  - "EFFECT OF HIGH-FAT, HIGH-PROTEIN, HIGH-CARBOHYDRATE MEALS ON THE PHARMACOKINETICS OF SMALL DOSES OF ETHANOL" Jones, Jonsson, Kechagias; Br J Clin Pharmacol. 1997.

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- **Absorption, Elimination, Peak BAC Time**
  - "EVALUATING ALLEGED DRINKING AFTER DRIVING – HIP-FLASK DEFENSE" Iffl and, Jones; Med. Sci. Law 2002.
  - "EVALUATION OF BLOOD-ETHANOL PROFILES AFTER CONSUMPTION OF ALCOHOL TOGETHER WITH A LARGE MEAL" Jones, Neri; Can. Soc. Forensic Sci. J. 1991.

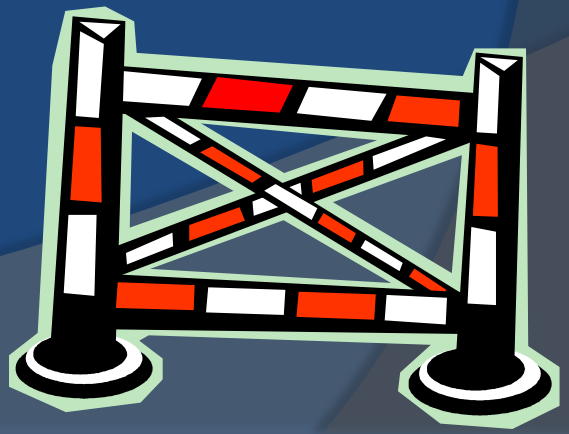
Meeting Defense Challenges

- **Other Defense Challenges**
  - Time of test laws were a side-stepping maneuver to get around lack of drinking history information in order to properly conduct a retrograde calculation
  - The journal articles cited by the National Safety Council subcommittee on Alcohol and Other Drugs, advocating for time of test laws is almost entirely alcohol absorption, distribution & elimination literature NSC CAOD literature concerning Time of Test Laws.pdf
  - Dubowski advocates time of test laws & retrograde extrapolation under carefully crafted hypothetical scenarios Dubowski 2006-Time Of Test & Retrograde extrapolation.pdf

Comments are VERY Important

- "The amendment recognizes that trial courts should serve as gatekeepers in assuring that proposed expert testimony is reliable and thus helpful to the jury's determination of facts at issue."

Defense likely to point court to this portion



Comments are VERY Important

- "The amendment is not intended to supplant traditional jury determinations of credibility and the weight to be afforded otherwise admissible testimony."

The Proponent's Friend

Battle of the Experts

- Disagreements between experts go to weight, not admissibility. *State v. Velasco,* (*Alday,* RPI), 165 Ariz. 480, 486 (1990).

- Where there is a lack of unanimity in scientific community on accuracy of breath test, "the scientific disagreement affects only the weight and not the admissibility of evidence." *State v. Olivas*, 77 Ariz. 118 (1954).

BATTLE OF THE EXPERTS

Rule 104(e) weight & credibility issues are for jury.

Determination of credibility of witnesses is question for jury.

State v. Rivera, 116 Ariz. 449 (1977)

Comments are VERY Important

- "nor is the amendment intended to . . . Prohibit testimony based on <u>competing methodologies</u> within a field of expertise."
  - Look to in "battle of the expert" scenarios
  - Retrograde – how much info is needed?

Comments are VERY Important

- “the amendment is broad enough to permit testimony that is the product of <u>competing principles</u> or methods in the same <u>field of expertise</u>.”

Comments are VERY Important

"court's gatekeeping function is not intended to replace the adversary system. Cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence."

1) Evidence does not have to be perfect
2) Remind court - defense is free to cross-examine, present its own evidence, etc.

Know the ENTIRE Comment, Anticipate & Prepare

Thank You!

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