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Cross Examination of the Breath Test Officer: Good Decisions Rest on Knowledge, Not Numbers

A jury trial is nothing more than conflict resolution. The purpose of trial is to ask a group of people who have no interest in the outcome of a case to decide a dispute and reach a verdict. We give them this task because the two sides could not come to an agreement over some conflict on their own. In a breath test case, helping the jury resolve this conflict with a not guilty verdict should involve a sound theory of the case. And this theory of the case should dictate how to cross examine a breath test operator.

In developing a theory of defense in a breath testing case consider asking the jury to place the evidence into its context, before reaching a conclusion. This type of request generates immediate credibility. It is reasonable to ask someone to put things into their proper context and makes perfect sense in a breath test case. After all, defense attorneys do not want a jury to focus solely on the reported blood alcohol concentration. Try asking someone what they think about your case after telling them only that the blood alcohol concentration was .16—twice the legal limit. Without more, you will almost never win.

Theories of case are best told using stories. One story useful in a "place the evidence into its context" case is *Seven Blind Mice,* by Ed Young. The story is based on an Indian fable. It is a tale about seven blind mice that come upon a strange object which the reader knows to be an elephant. Each mouse examines a part of the elephant, concluding with this limited information that the object is some

other object. Only when the seventh mouse explores all the parts of the object do they realize the elephant for what it is. The moral, of course, is that snippets can make fine tales, but true wisdom comes from seeing the whole. The story teaches us that one should always look at the context before making conclusions about anything.

Understanding the context in a breath test case requires a certain amount of knowledge of the science of breath testing. It is not credible to argue that the breath testing device itself is not trustworthy. In most states the jury is instructed that the device the police used to measure your client's breath is reliable and if used and maintained properly will generate a trustworthy result. What you want to challenge then is not the device itself, but the manner the device was used and/or maintained. That is where you will find the context to focus the jury's attention. This is called a "hook" and is found somewhere in the facts of your case. Some of these hooks are found in every breath test case and others are only found in certain fact patterns. Both will be addressed in this article, which is not meant to be exhaustive of every issue that can be cross examined in a breath test case. Instead, the article will address enough areas of cross examination to demonstrate how a cross examination of a breath test officer can be structured.

It is important to proceed with cross examination in a confident manner that communicates to the jury you know what you are talking about. After all, in cross examination it is the lawyer who does the communicating with the jury; the witness is only there to say yes or no to the leading questions the attorney asks. To exude such confidence, it is important to understand two important principles of science that form the basis for most breath testing: Henry's Law and Beer-Lambert Law of Absorption.

The scientific principle that is the foundation for breath testing is Henry's Law. Henry's Law was formulated by William Henry in 1803, and provides that "at a constant temperature, the amount of a given gas that dissolves in a given type and volume of liquid is directly proportional to the partial

pressure of that gas in equilibrium with that liquid."[1] A simpler definition perhaps is that the amount of a volatile substance in a liquid is directly proportional to the amount of that same volatile substance in the gas above that liquid in a closed environment. Henry's Law also requires the liquid and gas to be maintained at a constant temperature and pressure. An example of Henry's Law at work is in the ordinary bottle of soda. The contents of the bottle are kept in a closed environment at a constant pressure. Because of this pressure, the carbon dioxide (the gas that makes the beverage carbonated) is soluble in the liquid you enjoy drinking because of the bubbles. When you open the bottle, you release the pressure, the carbon dioxide becomes less soluble, and is released into the environment. Over time, the carbon dioxide releases completely, and you are left with flat soda.

An example of Henry's Law at work in breath testing is a wet bath simulator, often used as a reference standard in breath testing. The simulator contains a known concentration of ethyl alcohol, obtained from a traceable source. That solution is kept in a sealed environment and at a constant temperature. Since ethyl alcohol is volatile, it will exist both in the liquid and the gas in the sealed container. By measuring the ethyl alcohol in the gas above the liquid, a breath testing device can measure the amount of that same ethyl alcohol found in the liquid.

Breath testing for alcohol is based on the premise that by analyzing the amount of ethyl alcohol found in the breath (gas) we can quantify the amount of ethyl alcohol in the blood (liquid). To make that quantification the breath testing device must know the proportional relationship between the amount of ethyl alcohol in blood as compared to breath. This relationship between the concentration of ethyl alcohol found in the blood compared to the breath is referred to as the partition ratio, which for breath testing is assumed to be 2100:1. However the blood to breath partition ratio varies from person to person and is not constant for anyone. This theory as applied to breath testing has its faults which can be explored on cross examination and will be discussed below.

[1] James C. Garriott, Garriott's Medicolegal Aspects of Alcohol at 260 (5th Ed. 2008).

As for the Beer-Lambert Law of Absorption, many of today's breath testing devices rely upon infrared spectroscopy. In such breath testing devices an infrared optical sensor identifies different molecules based on the way they absorb infrared light. Molecules contain bonds which will absorb infrared light at different wavelengths. A photocell is used to detect how much infrared light ethanol bonds have absorbed. The photocell then sends a signal to a microprocessor which calculates a person's blood alcohol level based on how much light has been absorbed. The scientific principle upon which this is based is Beer-Lambert Law of Absorption.[2] The Beer-Lambert law provides that there is a linear relationship between absorbance and concentration of an absorbing species.[3]

Now that we have the scientific principles discussed, let's begin a discussion of areas of cross examination that can be pursued in every breath test case.

The breath test officer is a witness with a bias whose training and experience can often be attacked. Consideration should be given to how you mount that attack. There are many facts you can elicit from the breath test officer that can help your case. This includes but is not limited to the following: there is an assumed blood to breath partition ratio; temperature is important in breath testing; mouth alcohol can cause falsely high readings; and following procedures is necessary to ensure a reliable result in breath testing. If you plan to impeach the breath test officer on his lack of expertise you should first bring out all you can from the witness which will help you. After you do so, feel free to question their knowledge of the science. Even the more qualified breath test officers will be concerned about attorneys who question them on the science that underlies breath testing such as Henry's Law or Beer-Lambert Law of Absorption. Often the officer's response will be that they are not scientists, just breath test operators. Yet in getting that answer you have made your point.

[2] New Mexico State University, https://web.nmsu.edu/~kburke/Instrumentation/BeersLaw.html (last visited August 30, 2018).
[3] *Id.*

Be careful with your choice of words. Do not refer to the witness as a *technician*. Word choice is important. Call them an *operator*. The device he or she used to do the breath test is not "*an Intoxilyzer*" or a "*Datamaster,*" instead it is a *machine*. The result is a *reading* not a *blood alcohol concentration*.

It is also important to reveal to the fact finder just how biased this witness is. Sure, they testify, but only for the government. In fact, their job *requires* them to testify for the government. If they were to testify that in their opinion a breath test subject was not intoxicated that would mean their fellow officer was wrong. Questions related to the breath test operator's knowledge and bias may include:

a) You are a breath test operator?
b) Part of your job is to gather evidence against people charged with DUI?
c) When a person is brought to you for a breath test an arrest has already been made?
d) Another officer has made that arrest?
e) Based on an opinion that the person arrested was intoxicated?
f) If the testing you conducted led to a conclusion that the person was not intoxicated, your fellow officer would be wrong?
g) Another major part of your job is to testify against people charged with DUI?
h) You have testified for the prosecution before?
i) How many times?
j) How many times have you testified for a defendant on the topic of breath testing?
k) What is your educational background?
l) You have no advanced degrees in forensics?
m) You have no advanced degrees in Toxicology?
n) Are you a member of the American Academy of Forensic Sciences?
o) Are you a member of the Society of Forensic Toxicologists?
p) Have you published any peer reviewed articles on breath testing?
q) How many hours was the course for your schooling to come a breath technician?
r) How many of those hours were devoted to scientific theories and operations of breath testing machines?

The breath test analyzes a sample of *breath* air. Unless you are in a jurisdiction that prohibits driving with a certain breath alcohol concentration (BrAC), the machine prints out a result calculating the subject's *blood* alcohol concentration. Every breath test result is based on the presumption that there is a static relationship between the alcohol molecules in one's blood stream and the amount of alcohol molecules in the same person's breath. The breath testing machine is programmed to presume that 2100mL of breath contains the same amount of alcohol as 1 mL of blood. This is known as the

2100:1 ratio. This 2100:1 ratio is not the true partition ratio for every person and varies from person to person. Blood to breath partition ratios can also vary within specific individuals across a one-hour period. In a study conducted upon 21 males aged 30-55, alcohol research scientist A.W. Jones observed blood/breath partition ratios ranging between 1,837 to 2,666.[4] This provides an area of cross examination in every breath test case that results in a reported concentration of blood alcohol. Questions could include:

a) The machine reported a blood alcohol result?
b) But the machine takes a sample of breath?
c) Not blood?
d) You are familiar with the term partition ratio?
e) Partition ratio describes the relationship between the amount of alcohol molecules in one's blood stream in relation to the amount of alcohol molecules in one's breath, correct?
f) The machine relies on a partition ratio of 2100 to 1, does it not?
g) In other words, the machine is programmed to recognize that for every single part of alcohol in one's blood, there are 2100 parts of alcohol in one's breath, correct?
h) People don't necessarily have partition ratios in their bodies at 2100 to 1?
i) That is just an estimate?
j) And individual's blood to breath ratio can vary over time?
k) This machine does not account in its calculations for variable partition ratios from person to person, does it?
l) It is fixed at 2,100 to one?
m) It is one-size fits all?
n) If the defendant had a true partition ratio of less than 2100 to one, this machine would artificially inflate his true blood alcohol level, will it not?
o) There is no way for you to know what Mr. Walker's true partition ratio was on the night he was arrested, is there?

Another area that can be cross examined in every breath test case is the government's failure to report the uncertainty of its results. Technicians analyzing blood specimens in a laboratory environment using gas chromatography are required to report their results to a margin of uncertainty.[5] Yet uncertainty calculations are rarely if ever done in the field of breath testing, a far less reliable method of analysis.

[4] A.W. Jones, Variability of the Blood: Breath Alcohol Ratio in Vivo, J. STUD. ALC., Vol. 39, No. 11, 1973, at 1931.
[5] ISO. Guide to the Expression of Uncertainty in Measurement. International Organization for Standardization (ISO) and the International Committee on Weights and Measures (CIPM): Switzerland, 1993, updated in 2008.

There are many reasons for margins of uncertainty in breath testing. One of them is fluctuations in body temperature. The requirements of Henry's Law—a closed system with constant pressure and constant temperature—simply do not apply in the lungs. Fluctuations in body temperature can have a severe impact on the reported blood alcohol concentration. For every 1-degree Celsius increase in body temperature above that assumed by the device, there will be a corresponding drop of 6.5% in blood to breath partition ratio, resulting in an increase in reported blood alcohol concentrations of 6.5%.[6] Now consider that the average body temperature for humans is 37-degrees and the breath testing devices are certified with a simulator solution maintained at 34-degrees Celsius. This alone can falsely elevate reported blood alcohol concentrations by over 20 percent. Some questions might include the following:

a) Does the machine have a margin of error?
b) Do you refer to the margin of error as tolerance?
c) Prior to testing the defendant's breath, you ran a check on the machine using a simulator?
d) This is required?
e) This is part of your check list?
f) You use a simulator solution?
g) Simulator solution has a known amount of alcohol?
h) That known concentration of alcohol is .10?
i) The solution is kept at a specific temperature?
j) That temperature is 34 degrees Celsius?
k) Why? (This is one of those circumstances where an open-ended question works.)
l) The alcohol vapors are blown into the machine?
m) The machine generates a result?
n) You expect the reading to be .10?
o) Because that it what the known amount of alcohol in the simulator solution is?
p) But the results are acceptable if they are within an acceptable range of results?
q) .09-.11 is that range (this depends on your jurisdiction)(it should be noted that this may be more than what is allowed by the manufacturer of the breath testing machine)?
r) And this margin of error (uncertainty) is used when operating a simulator?
s) Which is in a closed environment?
t) The solution is kept at a constant temperature?
u) No risk of contamination?
v) The Defendant's test was not in a controlled environment?
w) You did not measure his temperature?

[6] Michael P. Hlastala, Physiological Laws of Alcohol Breath Testing, available at http://www.duistopped.us/physiology-bac-media/11.pdf.

x) And you told us why it was important to have a known and constant temperature? (You may wish to now confront the witness with the various studies that show the impact temperature can have on breath tests – consideration should be given to sending the officer these studies in advance of trial, so he cannot simply say he was not aware of them.)

There are many other lines of cross examination that can be conducted in most breath test cases. Consideration should be given to how many areas you want to attack and what is gained or lost in pursuing multiple lines of cross examination. Some lines of cross examination may be stronger than others depending on the facts of your case. Here is a list of some things to consider in many cases:

a) Was the machine calibrated for linearity? If it was only tested at a certain blood alcohol concentration, e.g. .10, then all you know is that it will be correct at .10 and the device has not been certified at the blood alcohol concentration in your case. An expert can be helpful to drive this point home.
b) The breath test officer did not preserve the sample to be retested. Many breath testing machines can preserve the sample for later testing. Preservation of sample is an important part of a forensically reliable test.[7]
c) Police officers will often record what happens in the field using recording equipment but choose not to record the observation period and/or the breath test.
d) Breath testing is an indirect measurement.
e) Breath testing is quick and inexpensive, and the government chose not to do a blood test.
f) The manufacturer's warranty is often expired long before the breath test was done.
g) There is often more current technology or better breath testing machines than what the government has used in your case.
h) Mouth alcohol is a concern in breath testing.
i) Slope detectors are rarely if ever calibrated or tested using a "dosed" subject.
j) If there was end breath contamination in a sample that contained mouth alcohol, the slope detector would not recognize it.
k) How you blow makes a difference or "the longer you blow the higher it will go."
l) Breath testing does not measure blood alcohol concentration at the time of driving.

There are areas of cross examination that can only be developed in certain cases based on their facts. The more breath testing cases you handle, the more you will be exposed to these and other issues that can arise in breath testing.

[7] Forensic Toxicology Laboratory Guidelines, 6.1.4 (2006), Society of Forensic Toxicologists, http://www.soft-tox.org/files/Guidelines_2006_Final.pdf.

Many issues can arise from the way the machine is maintained and calibrated. In every breath test case it is essential to do a thorough discovery demand and obtain as many documents as you can about the machine. You can use traditional approaches, such as discovery demands, subpoenas and Freedom of Information Act requests. You can also use creative approaches, such as sharing breath testing documents within your defense community and initiating law suits against the police departments for not complying with their discovery obligations. Whatever method you choose, get as many documents that you can that relate to the machine's maintenance and calibration and file motions to compel discovery not turned over to you by the government.

Some lines of cross examination relate to the subject who gives the breath sample. For example, gastroesophageal reflux disease, commonly referred to as GERD, is a digestive disorder that affects an estimated 30 million Americans annually. GERD affects the lower esophageal sphincter (LES), the ring of muscle between the esophagus and stomach. In normal digestion, the LES opens to allow food to pass into the stomach and closes to prevent solids, liquids, and gases from flowing back into the esophagus. Gastroesophageal reflux occurs when the LES is weak or relaxes inappropriately, allowing the stomach's contents to flow up into the esophagus. GERD is relevant in evaluating the reliability of a breath test result because the alveolar air sample collected from a person with GERD who has consumed a quantity of alcohol may be contaminated with gas, liquid or, even worse, solids that have a vastly higher concentration of alcohol than the alveolar air. The result is an artificially inflated blood alcohol concentration.[8]

[8] Several studies conducted by professionals in the field of forensic toxicology have concluded that esophageal reflux causes considerable distortion of the breath alcohol value. See, eg, David Wells and John Farrar (Office of Forensic Medicine, and Drager Australia, Melbourne, Victoria Australia), Breath-Alcohol Analysis of a Subject with Gastric Regurgitation, 11th International Conference on Alcohol, Drugs, and Traffic Safety, Chicago (1989); Alan W. Jones, Gastric Reflux, Regurgitation, and the Potential Impact of Mouth-Alcohol on the Results of Breath-Alcohol Testing, 22 DWI Journal, Law & Sci 1 (2007). A.W. Jones, one of the leading experts in the field of breath testing, wrote in his article Reflections on the GERD Defense, which appeared in the September 2005 issue of DWI Journal,

In a case where you plan to put on a GERD defense (which requires defense experts) consider using cross examination to establish facts which may be helpful to your defense. There are things that can exacerbate reflux, including the ingestion of alcohol, obesity, and the stress attendant to the client's arrest. Also of note in any breath test involving a subject with GERD is the pressure caused by a forced exhalation of breath attendant with giving a breath sample. Additionally, the external pressure on the stomach caused by having to lean over to give a breath sample can be an aggravating factor. Police officers often testify that the client's breath smelled of alcohol at the time of the breath test. This testimony can support the defense theory because it suggests that alcohol still in the client's stomach in liquid and gas forms was going back into the esophagus and mouth, indicating that the LES was open at the time of the breath test.

There are many other areas of cross examination that may be explored that are fact specific; these include but are not limited to:

a) States that do take one sample of breath. Replicate testing is a vital part of any breath testing quality assurance program.[9]
b) The disconnect defense in cases with a high blood alcohol concentration but a person who does not show symptoms consistent with such levels of intoxication.
c) The low blood alcohol concentration case involving allegations that a person appeared to be highly intoxicated with a low to moderate reported blood alcohol concentration. This can be used to demonstrate the police are overstating the allegations.
d) Radio frequency interference ("RFI") in cases where there is evidence that sources of RFI, such as cell phones may have interfered with a test.
e) Machines with repair records that suggest reliability concerns.
f) Mouth alcohol concerns in cases where the reliability of the observation period is in question.
g) Breath testing machines are not specific for alcohol. Look for evidence that there may be a concern for interferents caused by police officers mishandling the mouth pieces with their hands or other procedures that may expose the machine or the subject's breath sample to contaminants.
h) Inexperience by the officer conducting breath tests if newly trained and certified.

Law & Science : "The most compelling evidence that GERD might be a potential problem in connection with evidential breath-alcohol testing is related to the so-called 'mouth-alcohol effect.'"

[9] Kurt Dubowski, Quality assurance in breath-alcohol analysis, 18 J. of Analytical Toxicology 306 (1994).

The most important thing to elicit on cross examination is any failure by the breath test officer to follow a required procedure. Jurors will accept that machines are only as good as the person who operates them. Procedures which are required by the police department, checklists, operator's manuals, state regulations, or the scientific community provide the defense attorney with areas of attack when the breath testing procedures are not followed. Perhaps more importantly is that if you can uncover evidence of the failure to follow one required procedure, it invites concern that other procedures may also not have been followed. This creates reasonable doubt.

What is important is not simply the number that the breath testing machine printed. What is important is the context in which the machine measured the breath sample. The cross examination of a breath test officer should reveal that context to the jury and challenge whether that number is reliable. As Plato put it best, "a good decision is based on knowledge and not on numbers."