

IN THE SUPREME COURT
OF THE
STATE OF SOUTH DAKOTA

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STATE OF SOUTH DAKOTA,

Plaintiff and Appellee,

v.

NEAL J. LEMLER,

Defendant and Appellant.

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APPEAL FROM THE CIRCUIT COURT
OF THE SIXTH JUDICIAL CIRCUIT
HUGHES COUNTY, SOUTH DAKOTA

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HONORABLE JAMES W. ANDERSON
Judge

* * * *

MARTY J. JACKLEY
Attorney General

MAX A. GORS
Assistant Attorney General
Pierre, South Dakota

Attorneys for plaintiff
and appellee.

ROSE ANN WENDELL
Pierre, South Dakota

Attorney for defendant
and appellant.

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ARGUED ON APRIL 28, 2009

OPINION FILED 09/16/09

ZINTER, Justice

[¶1.] Probationer Neal J. Lemler’s alcohol monitoring bracelet registered three “drinking events,” and the State petitioned to revoke his probation. At the probation violation hearing, the circuit court ruled the State’s expert was qualified to testify concerning transdermal alcohol detection. At the end of the evidentiary hearing, the court ruled the methodology utilized in the alcohol monitoring bracelet met the *Daubert* standard for admissibility of scientific evidence. After considering conflicting expert opinions whether certain variables could have affected the monitoring bracelet’s results, the court entered findings that it was reasonably satisfied Lemler had consumed alcohol and violated probation. On appeal, Lemler challenges the qualifications of the State’s expert, the admissibility of the alcohol monitoring bracelet data under *Daubert*, and the sufficiency of the evidence to support a probation violation. We affirm.

Facts and Procedural History

[¶2.] Lemler was arrested for driving under the influence of an alcoholic beverage in September 2005. He pleaded guilty in April 2006 and was sentenced to two years in the penitentiary as a third-time offender. The court suspended execution of sentence and placed him on probation for two years.

[¶3.] As a condition of probation, Lemler was not to consume alcoholic beverages. On January 16, 2007, the court ordered use of a Secure Continuous Remote Alcohol Monitoring (SCRAM) bracelet to ensure compliance with this condition. Lemler was subsequently fitted with a SCRAM bracelet and he signed a

SCRAM participation agreement. The agreement prohibited the use of any product containing alcohol, whether consumable or not.¹

[¶4.] The methodology underlying the SCRAM bracelet is premised on the fact that when blood containing alcohol passes through capillaries in the skin, a portion of the alcohol is absorbed into water compartments. After absorption, the alcohol evaporates through the skin like perspiration. Detection of alcohol is based on the principle (not contested in this case) that people eliminate approximately 1% of consumed alcohol transdermally through sensible (liquid) and insensible (vapor) perspiration. The SCRAM bracelet measures transdermal alcohol concentrations (TACs) in the insensible perspiration. There is no dispute in this case that transdermal alcohol testing has, since 1985, been a generally accepted way to detect alcohol in the blood, and this form of testing has been verified by several methods and scientists. Lemler agrees that “transdermal alcohol analysis has been proven to work with beverage alcohol.” (Appellant’s Br 16.)

[¶5.] The SCRAM bracelet is worn just above the ankle. It is fastened to the ankle with a strap and locking clip. The bracelet consists of two components. The first contains a fuel cell that measures ethanol gas in the insensible perspiration. The second component contains electronics that detect tampering, removals, and

1. The agreement provided that Lemler was “. . . to abstain from any and all alcohol consumption and to refrain from the use of products containing alcohol and to not participate in restricted activities as described: Banned Products— ‘I understand that I am not to use or possess any product containing alcohol, including, but not limited to: mouthwash, medicinal alcohol, household cleaners and disinfectants, lotions, body washes, perfumes, colognes, or other hygiene products that contain alcohol.’”

obstructions. This component also collects, stores, and transmits the alcohol measurements via radio frequency link to a modem installed in the probationer's home. The modem uploads the data to Alcohol Monitoring Systems (AMS), the SCRAM manufacturer, for analysis. According to AMS, the bracelet "flags" all transdermal alcohol readings of .02% alcohol by weight or higher. A drinking event is not "confirmed" unless there are three consecutive measurements over .02%. According to AMS, this requires the consumption, on average, of at least two drinks per hour. During normal monitoring, readings are taken approximately every hour. When the bracelet detects a reading of .02% or greater, the bracelet begins taking readings every thirty minutes.

[¶6.] When apparent drinking events are detected, the data is analyzed by AMS technicians using known correlations between TACs and blood alcohol concentrations (BACs).² When a person consumes alcohol, blood alcohol levels follow predictable changes that, when plotted over time, produce a BAC curve. This curve has: an absorption phase as alcohol is consumed and absorbed into the blood; a distribution phase as alcohol is distributed by blood throughout the body; and, an elimination phase as the body processes and eliminates alcohol through the liver, breath, and skin. TAC readings are also plotted, producing a TAC curve. Although the TAC curve is correlated with the BAC curve, three differences are observable. First, the initial detection of transdermal alcohol is delayed.³ Second, peak TACs

2. The correlation used by AMS for beverage alcohol has not been challenged in these proceedings.

3. The delay is caused by the way the body processes alcohol.

are lower than peak BACs. Third, TACs remain elevated for a period of time after BAC levels return to zero.

[¶7.] To confirm or exclude a drinking event, AMS technicians compare the TAC curve, particularly the absorption rate, the peak concentration, the elimination rate, and the total elimination time against the same known parameters for BAC curves. AMS's analysis, like that commonly utilized in blood-alcohol testing, is based on averages for all humans. According to AMS, averages are chosen that eliminate false positive readings by disregarding readings that are not sufficiently high to suggest alcohol consumption. If the SCRAM bracelet's periodic measurements reflect a TAC curve that is sufficiently correlated with known averages for beverage alcohol consumption, AMS presumes a drinking event has occurred.

[¶8.] In some cases, the data may reflect that an obstruction or interferant has come into contact with the bracelet. Obstructions are objects (such as paper) that can be inserted between the bracelet and the skin. Interferants are substances that, through exposure to the bracelet, can produce a TAC reading. Interferants include products containing consumable and not consumable alcohols, as well as some chemicals found in products such as antifreeze and certain cleaners. According to AMS, interferants can be excluded from data indicating alcohol consumption because interferants produce a different TAC curve.

[¶9.] The AMS analysis does not attempt to quantify how much alcohol is in a person's blood. Rather, the analysis only determines whether the subject has consumed alcohol. If alcohol is detected but the TAC curve also suggests the

presence of an interferant, a drinking event is not confirmed. In those situations, AMS contacts the probation officer to question the probationer whether obstructions or interferants could have caused the SCRAM device to react. If interferants were being used, the data is reviewed again to see if the TAC curve is consistent with alcohol consumption and the concurrent presence of an interferant. If that review is not conclusive, then the event is not reported as a drinking event. If the data reflects alcohol consumption together with the use of an interferant, then a drinking event is reported.

[¶10.] Lemler's SCRAM bracelet detected transdermal alcohol on July 10, 11, and 12, 2007. On July 10, the bracelet detected alcohol at 8:00 p.m. On July 11, the bracelet detected alcohol at 11:00 a.m., continuing until after 1:00 a.m. the following morning, July 12. AMS technicians reviewed the data from the bracelet, and based on the TAC curves, concluded that Lemler had consumed alcohol. According to the AMS technicians, some of the data also reflected the presence of an interferant.

[¶11.] As a result of the data, the State filed a petition to revoke Lemler's probation. Lemler filed an affidavit denying that he had consumed alcohol and alleging that interferants used in his occupation as a farmer must have caused the readings. Lemler specifically alleged that he had been using John Deere brand graphite lubricant and starter fluid, and that he had cleaned out grain bins containing fermented grain. Lemler also called three witnesses who had different levels of contact with him on those days. Those witnesses testified that they did not observe evidence of alcohol consumption. Lemler finally alleged that he had sores

caused by the SCRAM bracelet, and that the sores may have contributed to the readings.

[¶12.] The State called Jeff Hawthorne as an expert witness to explain the AMS analysis and refute Lemler's arguments. Hawthorne is the Chief Technology Officer at AMS. Over Lemler's objections, the circuit court recognized Hawthorne as an expert in transdermal alcohol detection. After considering the conflicting evidence presented by the parties, the court also determined that Hawthorne's opinions met the *Daubert* standard for reliability of scientific evidence.

[¶13.] Regarding Lemler's interferants defense, Hawthorne testified that interferants were detectable and excludable because they produced a different TAC curve than that produced by beverage alcohol consumption. Hawthorne explained that if a person pours or spills alcohol or other interferants on or near the bracelet, the TAC curve reflects a sharp peak or spike with very quick elimination, neither of which is present in a drinking curve. He also indicated that, unlike TAC curves from consumed alcohol, the absorption rate of topical interferants is very fast. With respect to fermented grain vapor inhalation, Hawthorne testified inhalation could not produce measurable amounts of alcohol in the blood that could be eliminated transdermally. Regarding Lemler's sores, Hawthorne testified that the sores would not have any effect on the bracelet's alcohol readings.

[¶14.] Hawthorne further testified that he had tested graphite lubricant and starter fluid, and found that neither produced data like that exhibited in the July 10-12 data. Because Lemler disagreed with the testing, the John Deere brand graphite lubricant was shipped to AMS for retesting. AMS's retesting, in

Hawthorne's opinion, indicated that Lemler's alleged interferants did not cause the observed TAC readings. Hawthorne ultimately opined that, based on his education and experience, Lemler had consumed alcohol on the dates in question.

[¶15.] Lemler's expert witness was Dr. Michael Hlastala. Dr. Hlastala is an expert in physiology, alcohol physiology and pharmacokinetics.⁴ He had testified in at least six other SCRAM cases and had researched and published numerous articles on transdermal alcohol exchange. Dr. Hlastala studied the diffusion of alcohol and the dynamics of the process, including variables in the human body that can influence diffusion. According to Dr. Hlastala, fuel cell detection of alcohol, the technology used to detect alcohol in the SCRAM bracelet, is generally accepted, but has limitations. One limitation is that fuel cells are nonspecific for ethyl alcohol. Therefore, other types of alcohol such as methyl alcohol, isopropyl alcohol, butyl alcohol, and 2-butoxyethanol (interferants) may cause a fuel cell reaction. Another source of detectable interferants is the hydroxyl group (OH), which is found in glycols and some cleaning solutions. Consequently, Dr. Hlastala opined that if contamination from such interferants entered the body and were diffused through the skin, the shape of the interferant TAC curve "may" not be different from a beverage TAC curve. Although he conceded that these non-consumable alcohols may be toxic if consumed, he opined that long exposure to chemicals under certain confined conditions could result in substance absorption into the skin and

4. Pharmacokinetics relates to the body's processing of a substance like alcohol. Dr. Hlastala testified that it is "the way that alcohol is processed; it goes into the body, [is] absorbed, metabolized, distributed."

subsequent elimination, suggesting a possible source for fuel-cell readings unrelated to alcohol consumption.

[¶16.] After hearing the evidence, including the possibility of interferants having affected Lemler's bracelet's data, the circuit court found that the results of the SCRAM bracelet were relevant, reliable and met the *Daubert* standard of admissibility. After hearing the other lay witnesses, the court entered a finding that it was "reasonably satisfied that Neal Lemler consumed alcohol on the three occasions shown by the SCRAM bracelet." The court concluded that Lemler violated a condition of his probation.

Decision

Whether Hawthorne Was Qualified to Render an Expert Opinion

[¶17.] Lemler argues that Hawthorne lacked the qualifications necessary to testify as an expert witness on transdermal alcohol detection. Lemler points out that the SCRAM technology is scientific in nature. Lemler contends that Hawthorne was not a qualified expert because he is not a scientist, he had only co-published one article on the subject, he had not studied or been peer-reviewed on the physiology of alcohol, and his curriculum vitae did not reflect evidence of responsibilities concerning the science behind the SCRAM technology.

[¶18.] The admission of expert testimony is governed by SDCL 19-15-2 (Rule 702), which provides,

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.

Assuming that the assistance to the trier of fact requirement is met,⁵ the witness must also be “qualified.” *Klutman v. Sioux Falls Storm*, 2009 SD 55, ¶21, 769 NW2d 440 (citing *Burley v. Kytect Innovative Sports Equip. Inc.*, 2007 SD 82, ¶16, 737 NW2d 397, 404). “Whether a witness is qualified as an expert can only be determined by comparing the area in which the witness has superior knowledge, skill, experience, or education with the subject matter of the witness’s testimony.” *Maroney v. Aman*, 1997 SD 73, ¶39, 565 NW2d 70, 79. We review a trial court’s “decision to admit or deny an expert’s testimony under the abuse of discretion standard.” *Burley*, 2007 SD 82, ¶12, 737 NW2d at 402.

[¶19.] In this case, the evidence reflected that Hawthorne had substantial knowledge and experience in transdermal alcohol measurement and SCRAM technology. He had a bachelor’s degree in electrical engineering and had completed some work on a master’s degree in business administration. Although this educational background did not reflect expertise in transdermal alcohol measurement, Hawthorne is the chief technology officer at AMS. His experience in alcohol testing started in 1986, when he became involved in the design and development of hand-held breath testing equipment with both fuel cells and active sensor technology. In 1989, Hawthorne began researching transdermal alcohol monitoring, and by 1991, he co-invented the SCRAM bracelet. In June 2006, Hawthorne and Mark H. Wojcik, published an article, “Transdermal Alcohol Measurement: A Review of the Literature,” in the *Canadian Society of Forensic*

5. Lemler does not dispute that the “assistance to the trier of fact” requirement was satisfied.

Science, a peer-reviewed journal.⁶ Can. Soc. Forensic Sci. J. Vol 39 No 2 (2006) pp 65-71. Hawthorne had also qualified as an expert and testified on forty-eight prior occasions regarding transdermal alcohol testing.

[¶20.] Although Lemler acknowledges that Hawthorne has qualified as an expert numerous times on the subject at issue, he contends that numbers alone do not make him qualified to be an expert witness. Lemler also contends that because of Hawthorne's financial interest in AMS, he cannot claim expert status. We believe that although prior qualifications as an expert and financial interest in the company performing the test are factors to consider, neither is dispositive. In this case, the circuit court acknowledged Hawthorne's association with AMS and did not rely solely on Hawthorne's history as an expert witness. Instead, the circuit court relied on a number of factors. Explaining why it qualified Hawthorne as an expert on the subject matter of his proposed testimony, the circuit court found:

- Jeffrey Hawthorne has been working [in] the field of alcohol sensing for more than ten years.
- Jeffrey Hawthorne invented the SCRAM bracelet, had it patented in 1993 and currently is employed by [AMS] as the Chief Technology Officer.
- Jeffrey Hawthorne has conducted numerous scientific studies on transdermal monitoring and is an expert in the field.
- Jeffrey Hawthorne is an expert on the SCRAM bracelet and accompanying technology and has been accepted as an expert

6. Hawthorne's article surveyed existing studies and research on transdermal alcohol measurement. Hawthorne testified that he and his co-author "reviewed a lot of [the] articles and then we did experiments trying to duplicate what they did, and we were successful in duplicating a lot of their results. So along the way we were doing studies to justify the article that we were researching."

and testified in at least forty-[eight] courts in the United States.

- Jeffrey Hawthorne has studied transdermal alcohol sensing and has published a scientific treatise on the subject.
- Jeffrey Hawthorne's scientific treatise was published in the Canadian Journal of Science and has been subject to peer review.

[¶21.] “Reading, study, and practice can be a source of education and knowledge sufficient to qualify a person as an expert.” *Burley*, 2007 SD 82, ¶19, 737 NW2d at 404 (citing John W. Strong, McCormick on Evidence, § 13, 24 (5th ed 1999)). The circuit court relied on these factors in making its determination. “This court has consistently held that the trial judge has the discretionary power to determine whether a witness is an expert witness. As such, his ruling will not be disturbed ‘unless there is no evidence that the witness had the qualifications of an expert or the trial court has proceeded upon erroneous standards.’” *State v. Edmundson*, 379 NW2d 835, 839 (SD 1985) (citing *State ex rel. Helgerson v. Riiff*, 73 SD 467, 475, 44 NW2d 126, 139 (1950)). In this case, there was evidence that Hawthorne had expert qualifications and Lemler has not established that the circuit court proceeded upon erroneous standards. The circuit court did not abuse its discretion in qualifying Hawthorne as an expert witness.

Whether the SCRAM Data Met the Daubert Standard

[¶22.] South Dakota courts determine the admissibility of scientific evidence in accordance with *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 US 579, 113 SCt 2786, 125 LEd2d 469 (1993). *See State v. Weaver*, 2002 SD 76, ¶25, 648 NW2d 355, 364-65. The *Daubert* standard requires that the trial court ensure an expert's

testimony “rests on a reliable foundation and is relevant to the task at hand.” *State v. Hofer*, 512 NW2d 482, 484 (SD 1994) (quoting *Daubert*, 509 US at 597, 113 SCt at 2799). Lemler does not dispute the relevancy inquiry; he only challenges reliability, arguing that variables *may* affect the fuel cell methodology employed in the SCRAM bracelet.

[¶23.] “Pertinent evidence based on scientifically valid principles will satisfy [the reliability] demands.” *Id.* “The burden of demonstrating that the testimony is . . . reliable rests with the proponent of the testimony. . . . The proponent . . . must prove . . . admissibility by a preponderance of the evidence.” *Burley*, 2007 SD 82, ¶13, 737 NW2d at 403 (citing *Daubert*, 509 US at 592 n10, 113 SCt at 2796).

However, in reviewing a trial court’s “gatekeeper” role in screening such evidence, courts “may not categorically distinguish between rulings allowing expert testimony and rulings disallowing it.” *General Elec. Co. v. Joiner*, 522 US 136, 142, 118 SCt 512, 517, 139 LEd2d 508 (1997).

[¶24.] Furthermore, after *Daubert*, “general acceptance in the scientific community is no longer required [as a precondition to admissibility.]” *Hofer*, 512 NW2d at 484. The Supreme Court “reasoned that the ‘liberal thrust’ of the Federal Rules of Evidence . . . requires a more ‘flexible’ approach than *Frye’s* general acceptance threshold.” *United States v. Davis*, 40 F3d 1069, 1074 (10thCir 1994) (citing *Daubert*, 509 US at 594-595, 113 SCt at 2797-98). Under *Daubert’s* more flexible approach, four factors guide a court’s consideration: (1) whether the theory or technique in question can be (and has been) tested, (2) whether it has been subjected to peer review and publication, (3) its known or potential error rate and

the existence and maintenance of standards controlling its operation, and (4) whether it has attracted widespread acceptance within a relevant scientific community. 509 US at 593-94, 113 SCt at 2796-97. “The test of reliability is [, however,] ‘flexible,’ and *Daubert’s* list of specific factors neither necessarily nor exclusively applies to all experts or in every case.” *Kumho Tire Co., Ltd. v. Carmichael*, 526 US 137, 141, 119 SCt 1167, 1171, 143 LEd2d 238 (1999).

[¶25.] Finally, as is particularly relevant in this case, the proffered opinion may be inferred from accepted facts, and the subject of the scientific testimony need not be known to a certainty:

The adjective “scientific” implies a grounding in the methods and procedures of science. Similarly, the word “knowledge” connotes more than subjective belief or unsupported speculation. The term “applies to any body of known facts or to any body of ideas inferred from such facts or accepted as truths on good grounds.” Webster’s Third New International Dictionary 1252 (1986). Of course, it would be unreasonable to conclude that the subject of scientific testimony must be “known” to a certainty; arguably, there are no certainties in science.

Loftus, 1997 SD 131, ¶22, 573 NW2d at 173 (citing *Daubert*, 509 US at 590, 113 SCt at 2795). Thus, an expert may extrapolate from existing data as long as there is an analytical connection between the known data and the expert’s opinion. *Joiner*, 522 US at 146, 118 SCt at 519. In applying *Daubert*, “[t]he focus . . . must be solely on principles and methodology, not on the conclusions that they generate.” *Wells v. Howe Heating & Plumbing, Inc.*, 2004 SD 37, ¶16, 677 NW2d 586, 592 (citing *Daubert*, 509 US at 595, 113 SCt at 2797).

[¶26.] In this case, the circuit court found, “[b]oth experts . . . agreed that fuel cell technology is generally accepted for testing alcohol in the system,” and “[b]oth

experts . . . agreed that alcohol in the system can be detected and measured through transdermal monitoring using existing fuel cell technology.” Lemler does not dispute these findings. Further, there is no dispute that transdermal science began in 1936, when scientists discovered that they could estimate blood alcohol levels by analyzing perspiration from the skin. By 1985, scientists began using fuel cells and other devices to monitor alcohol from insensible perspiration. Studies concluded that ethanol was excreted in sufficient quantities to detect blood alcohol.

Hawthorne testified the methodology has been “verified through several different methods by several different scientists” and is “widely recognized as valid science within the scientific community.” Hawthorne cited a number of supportive published⁷ and unpublished⁸ studies.⁹

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7. Examples included a study by the Acadiana Criminalistics Laboratory in Louisiana, published in the *Louisiana Society of Forensic Toxicologist Newsletter*; a study by the Michigan Department of Corrections, published in the *Journal of Offender Monitoring*; and, a 2006 two-year study at the University of Colorado, Drs. Joseph T. Sakai, Susan K. Mikulich-Gilbertson, Robert J. Long, and Thomas J. Crowley, *Validity of Transdermal Alcohol Monitoring: Fixed and Self Regulated Dosing*, *Alcoholism: Clinical and Experimental Research*, Vol 30 No 1 (2006) pp 26-33. The latter study specifically involved the SCRAM bracelet. The study was partially funded by AMS and by The National Institute of Mental Health. The study reported no false positive indications. It further concluded that TACs did lag breath testing by two to three hours, the TAC peak was lower than that measured in breath testing, and that TACs took longer to return to zero. According to Hawthorne, this independent testing mirrored AMS’s testing.
 8. The example cited was a study by the National Law Enforcement and Corrections Technology Center in Alaska.
 9. At the time of hearing, Hawthorne identified a study completed, but not yet published, by the National Highway Traffic Safety Administration. That study has since been published. Although we do not rely on this study because it was not admitted at the hearing, it does not contradict

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[¶27.] Hawthorne further testified that the components of the SCRAM bracelet, and in particular, the fuel cell detection methodology, have been generally accepted in the commercial marketplace. For example, the evidence reflected that fuel cells are commonly used in evidentiary breathalyzers and preliminary breath testing devices used to detect alcohol. According to Hawthorne, the same sensor is used in approximately 50,000 hand-held alcohol measuring devices used on five continents. Lemler concedes that the SCRAM bracelet has been on the market since 2003, and that there are similar types of transdermal alcohol measuring devices on the market. Indeed, Lemler's own expert has written that, as of November 2007, SCRAM was being used in some fashion in at least 44 states. Michael P. Hlastala and Patrick T. Barone, *Identification of Transdermal Ethyl Alcohol*, DWI J. Law and Science, November 2007, at 1. Further, Lemler did not dispute that at the time of the hearing, AMS had performed over 92 million alcohol tests and had monitored 48,913 subjects over almost 4 million days of recorded monitoring in almost 1,500 jurisdictions. There was also no dispute that the theory of transdermal transport is utilized in many medical products commonly used

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Hawthorne's studies. On the contrary, it recognizes the validity of this methodology as a monitoring device. *See* Paul R. Marques and A. Scott McKnight, Evaluating Transdermal Alcohol Measuring Devices, p 50 (National Highway Traffic Safety Administration 2007) (concluding, "[t]he monitoring of alcohol consumption does not depend on precise measurement of BAC; it depends on the ability of a technology to detect abstinence violations as measured by a signal in excess of some minimal amount, such as .02 g/dL. *As a monitoring device for offenders, the transdermal concept is valid* and the benefit appears evident despite [other limitations not relevant to Lemler's case]." (emphasis added)).

today.¹⁰ Thus, Lemler's own expert witness agreed that from a scientific standpoint the SCRAM device, as a general principle, was scientifically sound.

[¶28.] Although Lemler concedes that transdermal alcohol analysis has been proven to work with beverage alcohol, he argues that there are "too many variables," which have not been subjected to scientific scrutiny, to admit Hawthorne's testimony. (Appellant's Reply Br 8.) Lemler's argument is based on the fact that the SCRAM bracelet's fuel cell does not distinguish between ethyl (beverage) alcohol and other types of nonconsumable alcohols and substances (interferants) that are commonly found in anti-itch creams, hand sanitizers, rubbing alcohol and antifreeze. *See supra* ¶8. Similarly, Lemler claims that prolonged contact with fermented grain, such as Lemler allegedly encountered, could have produced ethyl alcohol that could be inhaled or absorbed into his skin. Because TACs from these interferants could be detected by the SCRAM bracelet, Lemler argues that these other substances could produce a TAC curve that looks like one produced from consumed beverage alcohol. Additionally, Lemler contends that sores on one's leg, the thickness and hydration of the skin, and the environment in which the exposure to an alleged interferant occurred may skew the bracelet's result. Lemler concludes that there are too many variables, some of which have not been subjected to scientific scrutiny, to satisfy *Daubert*.

10. Hawthorne listed the following examples: nicotine patches, birth control patches, seasickness patches, nitroglycerin chest pain medication, blood pressure drugs, Ben Gay, Icy Hot, and muscle relaxants.

[¶29.] Hawthorne, however, identified an analytical basis to interpret the TAC data and account for these variables. He explained that with respect to different skin types and colors, the bracelet is initially calibrated for each individual. With respect to Lemler's claimed sore, Hawthorne testified that it would not have influenced the data reflecting alcohol consumption. Regarding interferants, Hawthorne testified that AMS was able to distinguish between interferants and consumed alcohol by comparing the TAC curves of the non-beverage alcohol/interferants that are exposed to the fuel cell. Hawthorne testified that AMS relied on internal testing¹¹ and experience, as well as peer reviewed literature documenting differences in absorption rates, elimination rates, and the total elimination time for consumed alcohol and interferants. *See infra* ¶30. Under AMS's analysis, unless all three of these distinguishing features reflected consumed alcohol on a TAC curve, AMS declined to confirm a drinking event.

[¶30.] Lemler, however, argues that while AMS asserts that a TAC curve from non-drinking events is expected to look different than a curve associated with a drinking event, there are no scientific, peer-reviewed studies indicating that the TAC "for a non-drinking episode will always" produce the data upon which AMS relies. (Appellant's Reply Br 4.) Although Hawthorne conceded that interferant data had not been studied at any "great length," Hawthorne testified that through

11. Hawthorne testified that AMS conducts ongoing studies. One study examined 16 people over 30 days. Although the study indicated that not all confirmed "drinking events" were detected, their technology produced a false positive rate of approximately .12%. In comparison, Hawthorne testified that the false positive rate was approximately 1% for the State laboratory and approximately 5% for commercially available drug kits.

internal testing of numerous interferants, including those allegedly used by Lemler, AMS could assess whether the data reflected alcohol consumption or an interferant. Hawthorne also relied on research by Dr. Giles disclosing the type of data that was expected of non-consumed alcohol.¹² Although Hawthorne conceded that there was one study indicating that the pharmacokinetics of transdermal ethanol in humans is not well understood, he indicated that the debate was not over the differences observed in data from interferants, but the reason why interferants caused differences. Although Hawthorne finally acknowledged that variables could affect the data,¹³ he testified the absorption and elimination rates used in the AMS analysis¹⁴ were set conservatively enough to give a bracelet wearer the benefit of the doubt and not report false positive results.¹⁵

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12. Dr. Giles' research was discussed at several points during the hearing. Some of his work examined the potential for false readings created by toiletries and perfumes, as well as the interferant curve of pure ethanol placed on the body near the sensor. H.G. Giles et al., *Ethanol Vapor Above Skin: Determination by a Gas Sensor Instrument and Relationship with Plasma Concentration*, *Alcoholism: Clinical and Experimental Research*, Vol 11 No 3 (1987) p 249.
 13. Hawthorne acknowledged variables such as thickness and hydration of the skin can affect how much and how fast alcohol is emitted. Although Hawthorne also acknowledged that a sore could affect absorption and elimination rates, the variation would not be outside the limits for Lemler's testing. Hawthorne was also cross-examined on variables such as clothing worn, climate, temperature, and humidity. In each case, he explained the reasons why, in his opinion, those variables would not have changed the outcome of their analysis in Lemler's case.
 14. Lemler's expert agreed with AMS's assumption regarding the elimination rate as a "reasonable choice for a cutoff" in this case.
 15. Hawthorne testified that the bracelet has been tested in their laboratory and is calibrated conservatively so that the bracelet wearer has to consume "a fairly decent rate of at least two drinks an hour for us to confirm an alcohol
(continued . . .)

[¶31.] Nevertheless, Lemler criticizes the studies upon which AMS has relied. Lemler points out that one study has not been subject to peer review and another was funded by AMS. Although these criticisms are relevant, they are not dispositive. In *Joiner*, the Supreme Court held that it was within a trial court's discretion to conclude that the studies upon which the experts relied were sufficient, whether individually or in combination, to support their conclusions. 522 US at 146-47, 118 SCt at 519.¹⁶

[¶32.] It is also significant that AMS tested the specific interferants Lemler claimed had caused the observed readings in this case. Hawthorne tested both the John Deere starter fluid and graphite lubricant that Lemler claimed he was using. Both were tested individually and in combination in environments similar to those Lemler claimed existed.¹⁷ All testing of the claimed interferants produced data that was consistent with consumed alcohol and the presence of an interferant. Further, although Dr. Hlastala's concern related to the possible detection of other

(... continued)

event . . . [w]e're looking for a rate of consumption of at least two drinks an hour."

16. Moreover, although Lemler suggests AMS's studies are insufficient, we note that the National Highway Safety Administration has recently cited the same studies in its review of the effectiveness of the SCRAM bracelet. *See* Marques & McKnight, *supra* note 9.

17. Although Lemler claimed the environments were not similar, Hawthorne explained that based upon the conditions reflected in Lemler's affidavit, the differences would not have changed the result because of the volatility of the claimed interferants involved.

substances,¹⁸ he testified that he had no reason to believe interferants were actually involved or that other variables actually affected the outcome in this case. Finally, with respect to Lemler's claimed inhalation of fermented grain fumes, Hawthorne testified the amount of alcohol consumable in that manner was so small that it could not raise blood-alcohol levels to measurable amounts. Hawthorne indicated a number of studies confirmed inhalation does not significantly raise blood alcohol levels, and Lemler's expert did not challenge this opinion.

[¶33.] It is most significant Dr. Hlastala agreed "with the science of transdermal alcohol exchange," the "principle" that "transdermal alcohol exchange can be measured by a machine," that "the SCRAM device can measure whether there is alcohol in the person's system," and that "in principle it can be useful for its intended purpose." He agreed fuel cell detection of alcohol was "an accepted way to test alcohol with the limitation that it is nonspecific for ethyl alcohol."¹⁹ Therefore, Dr. Hlastala agreed that for determining probable cause, "the SCRAM device is pretty good for probable cause," and the device "is suitable for that." Considering

18. Dr. Hlastala's concern was in the "borderline situations" in which he believed the device to be limited in its ability to detect alcohol with certainty. Dr. Hlastala, however, offered no testimony that one of his *possible* variable scenarios actually affected the transdermal alcohol detection in this case.

19. When directly asked about the scientific validity of the SCRAM technology, Dr. Hlastala testified that it was sound.

Q: From a scientific standpoint, do you believe that the SCRAM device as a general principle is scientifically sound?

A: The answer to that is yes, to a limited degree. I think the principle of measuring transdermal alcohol is laudable and serves its purpose. . . .

this was a probation violation, which only required that a court be “reasonably satisfied” that a violation occurred, *see infra* ¶40, Lemler’s own expert confirmed the requisite level of reliability of the SCRAM bracelet in this case.

[¶34.] Ultimately, Lemler’s arguments are based on the suggestion that Hawthorne’s *conclusions* drawn from the accepted scientific process of transferable diffusion of alcohol *could* be incorrect. “A party who offers expert testimony is not [, however,] required to prove to a judge in a *Daubert* hearing that the expert’s opinion is correct: all that must be shown is that expert’s testimony rests upon ‘good grounds, based on what is known.’ Any other deficiencies in an expert’s opinion or qualifications can be tested through the adversary process at trial.” *Burley*, 2007 SD 82, ¶24, 737 NW2d at 406 (citing *Daubert*, 509 US at 590, 113 SCt at 2795). That is what occurred in this case.

[¶35.] Although Lemler’s expert opined that variables *could* affect the outcome or conclusion, there was evidence that the underlying scientific process was widely accepted, the theories and techniques in question either had been or could be tested, the process has been subjected to some review and publication, and potential error rates (under the evidence presented) are lower than some other accepted methods of measuring alcohol consumption. The issues concerning “possible” interferants, as well as the possibility of inhaled ethanol from fermented grain, were factual variables argued to the fact-finder. Under the circumstances, both this Court and the Supreme Court have recognized that a trial court does not abuse its discretion in admitting the scientific evidence and then letting the fact-finder resolve the factual dispute.

[¶36.] For example, an analogous argument was raised and rejected by this Court in a case involving the intoxilizer. *See Hofer*, 512 NW2d at 484. The general scientific principles underlying the intoxilyzer were not in dispute, but that defendant challenged reliance on an assumed ratio between alcohol levels in the breath and blood. At trial, the defendant presented evidence that the State’s assumed ratio was variable and not applicable to every person. Further, there was no evidence presented to show what specific ratio would be appropriate for the defendant. Nevertheless, we noted that the trier of fact heard the defendant’s evidence concerning the potential inaccuracies in the intoxilyzer test results in light of those potential variables. We found no abuse of discretion in allowing the trier of fact to determine how much weight it would give to the intoxilyzer test results. *Id.*

[¶37.] The Supreme Court has more specifically stated that a scientific opinion may be admitted under *Daubert* despite the existence of potential variables affecting the conclusion. In *Joiner*, the Court faulted a party seeking admission of a medical conclusion because the proponent relied on a scientific study that, although involving a study of animal subjects, failed to explain “how and why the experts could have extrapolated their opinions from these seemingly far-removed animal studies” 522 US at 144, 118 SCt at 518. Although the Supreme Court found fault with that deficiency, it recognized other “[t]rained experts commonly extrapolate from existing data.” *Id.* at 146, 118 SCt at 519. Thus, an expert’s opinion is not disqualified simply because variables require extrapolation from known data. It is only when “opinion evidence . . . is connected to existing data only by the *ipse dixit* of the expert [a] court may conclude that there is simply too great

an analytical gap between the data and the opinion proffered.” *Id.*²⁰ Unlike the situation in *Joiner*, Hawthorne identified an analytical connection for his extrapolation: he relied on studies, internal testing, and experience involving millions of similar tests.

[¶38.] In the final analysis, Lemler’s arguments regarding the SCRAM bracelet merely involve his disagreement with extrapolating from known facts.²¹ Further, Lemler’s expert testimony reflects that he would essentially require something that *Daubert* does not: scientific certainty. When asked what form of alcohol testing he believed appropriate, Dr. Hlastala’s response reflected he did not believe any extrapolation from known principles was appropriate. He stated:

The best [test] is blood, measuring blood directly. Any other test is more indirect. A breath test is more indirect. A SCRAM device is even more indirect. And the more indirect you are, the more variables there are. It’s a simple matter. If you want to measure something, measure it directly.

20. Lemler, quoting *Gilbert v. Daimler-Chrysler Corp.*, 470 Mich 749, 783, 685 NW2d 391, 409 (2004), argues that there is too great an analytical gap between the data and the opinion offered. In *Gilbert*, however, the Michigan court only held that a social worker was not qualified to offer expert medical testimony, stating: “[T]he faux ‘medical’ opinion of an individual who lacked any medical education, experience, training, skill, or knowledge became the linchpin of plaintiff’s case and unmistakably affected the verdict.” *Id.* at 410. The Michigan court observed that the social worker “gave plaintiff a ‘prognosis’ on the basis of his interpretation of records from medical and treatment facilities. The medical ‘prognosis’ of a social worker who has no training in medicine and lacks any demonstrated ability to interpret medical records meaningfully is of little assistance to the trier of fact.” *Id.* at 789-90, 685 NW2d at 413. This case, dealing with the qualifications of a social worker to give a medical prognosis, involves the qualifications of the expert rather than a qualified experts extrapolation from known data. Lemler’s reliance on *Gilbert* is misplaced.

21. Dr. Hlastala opined that the shape of the curve suggested interferants, and the alcohol levels recorded were too low.

This reasoning is not a basis for challenging scientific evidence. *Joiner*, 522 US at 144-46, 118 SCt at 518-19.

[¶39.] Lemler’s position at oral argument also reflects an incorrect focus. Lemler conceded the underlying technology was accepted. He only questioned how variables, including non-beverage alcohol, affected the *conclusion*. As previously noted, we have rejected that basis for challenging scientific evidence. *See Wells*, 2004 SD 37, ¶16, 677 NW2d at 592 (citing *Daubert*, 509 US at 595, 113 SCt at 2797) (observing that our courts must focus “solely on principles and methodology, not on the conclusions that they generate”).

[¶40.] Finally, it must be remembered that a circuit court has “considerable leeway’ in deciding in each case ‘how to go about determining whether particular expert testimony is reliable.’” *Burley*, 2007 SD 82, ¶25, 737 NW2d at 406 (citation omitted). We review a circuit court’s “decision to admit or deny an expert’s testimony under the abuse of discretion standard.” *Id.* ¶12, 737 NW2d at 402. “Although we have repeatedly invoked stock definitions, the term ‘abuse of discretion’ defies an easy description. It is a fundamental error of judgment, a choice outside the range of permissible choices, a decision, which, on full consideration, is arbitrary or unreasonable.” *Id.* (quoting *Arneson v. Arneson*, 2003 SD 125, ¶14, 670 NW2d 904, 910). The circuit court did not make such a decision in determining that Hawthorne’s opinions, based on the SCRAM technology, satisfied *Daubert* under the evidence presented in this case.

Whether the Circuit Court Erred in Concluding Lemler Violated His Probation

[¶41.] Lemler argues that other evidence showed he had not been consuming alcohol on July 10, 11, and 12, 2007. Under the applicable burden of proof in a probation revocation case, a court need only be “reasonably satisfied” a violation has occurred. *State v. Beck*, 2000 SD 141, ¶7, 619 NW2d 247, 249 (indicating, “[a]ll that is required is that the evidence and facts be such as to reasonably satisfy the judge that the conduct of the probationer has not been as good as required by the conditions of probation.”). We apply the clearly erroneous standard to findings of fact in a probation revocation proceeding. SDCL 15-6-52(a); *State v. Short Horn*, 427 NW2d 361, 362 (SD 1988). Findings of fact reviewed under that standard will not be disturbed unless we are left with a definite and firm conviction that an error was made. *Baldwin v. Nat’l College, a Div. of Dlorah, Inc.*, 537 NW2d 14, 17 (SD 1995).

[¶42.] AMS provided an extensive report of data collected from Lemler’s bracelet. Hawthorne compared the absorption and elimination rates of the alcohol. Both reflected results that would be expected from alcohol consumption. In the first event, starting at 8:16 p.m., a time outside the normal working day in which Lemler’s alleged interferants would have been normally used, the data did not reveal the “spike” associated with interferants. Further, the data reflected alcohol elimination throughout the night when Lemler would have been sleeping. The data from the second event indicated an interferant, but that event started at 11:10 a.m. and ended at 1:36 a.m. the next morning. Therefore, in order for interferants to have been the only source of the data, the interferant would have had to have been

applied at every one-half-hour reading taken by the bracelet. Moreover, even if such an attempt had succeeded, the data would have produced sharp curves with spikes, unlike those reflected on Lemler's TAC curve. Finally, even Dr. Hlastala conceded that if Lemler had actually been exposed to the environmental interferants Lemler claimed, they would have caused the fuel cell to react at other times than the isolated instances reflected in Lemler's data.

[¶43.] With respect to violations, the circuit court found the following facts:

- The SCRAM bracelet worn by Neal Lemler recorded three separate drinking events in July 2007.
- On July 10, 2007, the SCRAM bracelet showed a normal drinking event.
- On July 11, 2007, the SCRAM bracelet showed a drinking event with an interferant at the end.
- On July 12, 2007, the SCRAM bracelet showed a drinking event with an interferant at the beginning followed by alcohol consumption.
- The SCRAM bracelet worked properly.
- The [c]ourt is reasonably satisfied that Neal Lemler consumed alcohol on the three occasions shown by the SCRAM bracelet[.]
- The [c]ourt is reasonably satisfied that Neal Lemler violated the condition of his probation that he not consume or possess any alcoholic beverage while on probation.

[¶44.] Lemler, however, argues that three of his witnesses indicated that they neither smelled alcohol nor saw any indication that Lemler had been drinking on the relevant dates. We stated in *Rousseau v. Gesinger* that “the weight of the evidence and the credibility of the witnesses is largely a matter of the trial court’s

determination[.]” 330 NW2d 522, 524 (SD 1983). In this case, the circuit court was within its discretion in not attaching controlling weight to Lemler’s witnesses.

[¶45.] Lemler also argues that the timing of the alleged violations is significant: (1) it was mid-July, when heat and humidity could have influenced the SCRAM bracelet, and (2) he was wearing soiled work clothes between 10:00-11:00 a.m., which is the time the TAC curve reflects an interferant and the beginning of alcohol consumption. As previously explained, however, AMS had tested for those scenarios and it did not change its conclusions. Hawthorne testified:

Q: [I]f it’s [starter fluid or lubricants] ongoing on his hands and on his clothes and it’s being sprayed and he’s working on machinery and he’s in a shop that’s hot and humid, isn’t that going to affect the outcome, you know, make your tests somewhat invalid?

A: I don’t believe so. I mean, we had it on the pants of the subjects. They wore the pants for five or six hours. There was no reaction to it.

Further, as previously mentioned, Lemler’s arguments are not supported by his own expert. Dr. Hlastala never suggested that Lemler’s possible scenarios likely occurred. He only indicated they were “hypotheticals.” The circuit court apparently agreed.

[¶46.] The circuit court need only have been “reasonably satisfied” that a violation occurred. *Beck*, 2000 SD 141, ¶7, 619 NW2d at 249. The court specifically found that it was reasonably satisfied by the State’s evidence, and this Court is not left with a firm and definite conviction that a mistake was made.

[¶47.] Affirmed.

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[¶48.] GILBERTSON, Chief Justice, and KONENKAMP, MEIERHENRY,
and SEVERSON, Justices, concur.