IN THE COURT OF APPEALS
STATE OF ARIZONA
DIVISION ONE

STATE OF ARIZONA,	)	1 CA-CR 02-0739
	)	
Appellee,	)	DEPARTMENT B
	)	
v.	)	**O P I N I O N**
	)	
RONALD MICHAEL LUCERO,	)	Filed 3-23-04
	)	
Appellant.	)	
	)	

Appeal from the Superior Court in Maricopa County
Cause No. CR 2001-008632

The Honorable Crane McClennen, Judge

AFFIRMED

Terry Goddard, Attorney General — Phoenix
By Randall M. Howe, Chief Counsel,
Criminal Appeals Section
and Alan L. Amann, Assistant Attorney General
Attorneys for Appellee

Susan Sherwin, Maricopa County Legal Advocate — Phoenix
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Attorneys for Appellant

L A N K F O R D, Judge

¶1 Defendant Ronald M. Lucero timely appeals his sentences and convictions for aggravated assault, possession of marijuana and drug paraphernalia, and four counts of endangerment.

¶2 This appeal raises three issues. Two issues concern the admissibility of evidence under *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). We must decide whether a *Frye* hearing was

required before admitting scientific evidence based on gas chromatography/mass spectrometry ("GC/MS").[1] We must also determine whether a *Frye* hearing was necessary before allowing an expert to testify that, in his opinion, marijuana impaired

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[1] A description of GC/MS testing is as follows:

> The gas chromatograph, which is essentially an extremely sensitive filtering machine[,] is instrumental in breaking down a gas sample or a liquid mixture into its molecular subcomponents. If, for example, an individual wanted to ascertain the molecular compounds in a particular liquid, the sample would be mixed with a liquid solvent. The mixture is then heated until it forms a gas. The gas is then forced through a column, which is a glass tube filled with special filtration material. Each molecular compound in the sample will elute through a given column and temperature at a specific rate. A detector is attached at the outgoing end of the column which records the quantity and concentration of each particular molecular compound contained in the sample.
>
> During this process, a mass spectrometer may be used in conjunction with the gas chromatograph. A mass spectrometer bombards the sample with high-energy electrons to generate extensive fragmentation ions. Because the sample is broken up to such a degree, the equipment can accurately determine which compounds are present. Using [gas chromatography and mass spectrometry] simultaneously yields information about the sample with a high specificity level.

Peter Joseph Bober, *The "Chemical Signature" of the Fourth Amendment: Gas Chromatography/Mass Spectrometry and the War on Drugs*, 8 Seton Hall Const. L.J. 75, 79-80 (1997). *See also* Jefferson Lankford, *Arizona DUI: A Manual for Police, Lawyers, and Judges* 59-62 (2003-2004 ed.) (2003) (describing gas chromatography).

Defendant at the time of the accident. Finally, we decide whether a jury instruction unconstitutionally shifted the burden of proof to Defendant.

¶3 The charges against Defendant arose out of a collision between the vehicle Defendant was driving and another vehicle. Defendant had failed to yield the right of way. The State alleged that Defendant's use of marijuana had impaired his ability to drive. A jury convicted Defendant on all counts.

¶4 The State introduced evidence of Defendant's impairment in part through the testimony of Raymond Kelly, a forensic toxicologist with a Ph.D. in chemistry. Dr. Kelly testified about the results of GC/MS tests performed on blood and urine samples taken from Defendant after the collision.[2] Defendant's blood tested positive for tetrahydrocannabinol ("THC"),[3] the active component in marijuana, and for metabolites of THC.[4] Defendant's

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[2] A total of four biological samples were analyzed: one urine sample and three blood samples taken at different times. GC/MS testing was performed on all but one of the samples after an initial screening test and resulted in detecting the presence of THC or its metabolites in all three samples. The quantities of these substances detected were minute, measured in nanograms per milliliter of blood or urine. A nanogram is one billionth of a gram.

[3] Nothing in the human body produces THC; THC occurs naturally only in the *Cannabis sativa*, or marijuana, plant.

[4] A metabolite is "any substance produced by metabolism or by a metabolic process." Dorland's Illustrated Med. Dictionary 942-43 (25th ed. 1974). "[C]annabinoid metabolites [are] the byproducts created by the body's interaction with the chemical ingredients of marijuana." *Weller v. Ariz. Dep't of Econ. Sec.*,

urine also tested positive for a metabolite of THC. THC is a central nervous system depressant.

¶5 Defendant requested a pretrial *Frye* hearing. He challenged the admissibility of the GC/MS tests and Dr. Kelly's opinion testimony regarding Defendant's alleged impairment. Defendant argued that the testing methods were "faulty," and produced a scientific journal article to support this contention.[5] Defendant also argued that no scientific evidence demonstrated that his ability to drive safely had been impaired by the levels of THC found in Defendant's system. The superior court denied the motion, held no *Frye* hearing, and at trial admitted the evidence.

¶6 We have jurisdiction pursuant to Article 6, Section 9, of the Arizona Constitution and Arizona Revised Statutes sections 12-120.21(A)(1) (2003), 13-4031 (2001), and 13-4033(A) (2001). We affirm because the superior court did not err in admitting the evidence or in instructing the jury.

¶7 The evidence of the GC/MS test results were not subject to a *Frye* hearing. This scientific method is not novel. It has long been not only generally accepted, but praised for its accuracy.

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176 Ariz. 220, 222, 860 P.2d 487, 489 (App. 1993).

[5] Alan H.B. Wu, Ph.D. et al., *Minimal Standards for the Performance and Interpretation of Toxicology Tests in Legal Proceedings*, 44 J. Forensic Sci. 516 (1999).

¶8 The admissibility of certain scientific evidence in Arizona is determined by the *Frye* standard. *Logerquist v. McVey*, 196 Ariz. 470, 490, ¶ 62, 1 P.3d 113, 133 (2000). *Frye* requires that the scientific principles and the techniques of their application be shown to be "generally accepted in the relevant scientific community" before first being accepted as evidence. *State v. Bible,* 175 Ariz. 549, 578, 858 P.2d 1152, 1181 (1993).

¶9 A *Frye* hearing is not required every time scientific evidence is offered. A *Frye* determination is required only for new, novel or experimental scientific evidence. *Logerquist*, 196 Ariz. at 475, ¶ 19, 1 P.3d at 118; *State v. Varela*, 178 Ariz. 319, 325-26, 873 P.2d 657, 663-64 (App. 1993). It is therefore not necessary to subject evidence to a *Frye* analysis if the evidence does not rely on novel scientific principles or techniques. *Varela*, 178 Ariz. at 325-26, 873 P.2d at 663-64. We review the decision on whether to hold a hearing pursuant to *Frye* for an abuse of discretion. *Id.* at 326, 873 P.2d at 664.

¶10 Although no Arizona cases declare explicitly that GC/MS results are admissible, GC/MS technology has long been accepted by the courts and used by scientists as a standard analytic method. More than a decade ago, we noted that the reported accuracy rate of this method in drug detection is 99.99 percent and that it was a standard drug testing procedure. *Weller*, 176 Ariz. at 222, 225, 860 P.2d at 489, 492. In fact, the GC/MS method has been used to

test for drugs since the 1960s. *State v. Sercey*, 825 So.2d 959, 961 n.1 (Fla. Dist. Ct. App. 2002) (citations omitted). The method is so widely accepted that even the article relied upon by Defendant in this case states that "[m]ost toxicologists consider GC/MS as the 'gold standard' for forensic testing . . . ."[6] Test results obtained by this method are widely admitted by courts.[7]

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[6] Wu, *supra*, 44 J. Forensic Sci. at 521. *See* Edward J. Imwinkelried, *Should the Courts Incorporate a Best Evidence Rule Into the Standard Determining the Admissibility of Scientific Testimony?: Enough is Enough Even When It is Not the Best*, 50 Case W. Res. L. Rev. 19, 32 (1999) ("GC/MS is the 'gold standard,' widely regarded as the 'most accurate' and 'most reliable' analytic technique."); *Sercey*, 825 So.2d at 961 n.1 ("GC/MS analysis is generally accepted in the scientific community as the best method for determining the presence and quantity of THC and [THC metabolites] in blood."). *See also* Lankford, *supra*, at 61 ("Because of its accuracy of measurement and ability to screen out alcohol compounds other than ethanol, gas chromatography is considered the state of the art forensic test for blood alcohol content."). Dr. Kelly also testified in this case that GC/MS testing is accepted by the scientific community as an accurate and reliable means to detect and determine the level of drugs in biological samples.

[7] *People v. Deluna*, 777 N.E.2d 581, 600 (Ill. App. Ct. 2002) ("[A]ppellate courts time and again deal with and accept GCMS testing in controlled substance cases . . . ."). *See also*, *e.g.*, *Goebel v. Warner Transp.*, 612 N.W.2d 18, 22 n.3 (S.D. 2000) ("In fact, surveys have rated [] GC/MS as 'nearly infallible.'") (citing *Taylor v. O'Grady*, 888 F.2d 1189, 1192 n.4 (7th Cir. 1989)); *Commonwealth v. Martin*, 696 N.E.2d 904, 907 n.5 (Mass. 1998) ("Gas chromatography mass spectrometry 'is, for all practical purposes, 100% accurate.'") (quoting *Pella v. Adams*, 702 F. Supp. 244, 246 (D. Nev. 1988)). And the United States Supreme Court, discussing drug findings confirmed by GC/MS, has said that as long as the tests are properly conducted, GC/MS tests detect drugs in biological samples with "great accuracy." *Skinner v. Ry. Labor Executives' Ass'n*, 489 U.S. 602, 610 n.3 (1989).

¶11 Defendant nevertheless challenged the evidence based on GC/MS analysis, requesting a *Frye* hearing to determine its admissibility. The absence of a reported Arizona opinion expressly approving this scientific method does not confer an automatic right to a hearing. Evidence relying on this method has long been admitted in Arizona courts and has been accepted in the scientific community for drug testing even longer. "By its own words, *Frye* applies to the use of *novel* scientific theories or processes to produce results." *Logerquist,* 196 Ariz. at 475, ¶ 19, 1 P.3d at 118 (emphasis added). Defendant only attacked the validity of GC/MS testing; he did not argue that it was a novel method of scientific analysis. On the contrary, Defendant conceded that the method is not new. As a result, no separate pretrial *Frye* hearing was required. *State v. Morgan*, 204 Ariz. 166, 174, ¶ 32, 61 P.3d 460, 468 (App. 2002).

¶12 This is not to say that, once admitted, scientific evidence is forever after unassailably admissible. After all, some theories once generally accepted ultimately have been rejected in favor of new ones. Quantum physics, for example, has changed scientists' understanding of the nature of energy and matter, including Einsteinian theories which in turn had challenged earlier Newtonian ideas. In a perhaps more vivid example, Ptolemy's idea that the sun revolves around the Earth held sway for centuries,

until Nicolaus Copernicus and Galileo Galilei demonstrated otherwise.

¶13 But Defendant's challenge of the scientific method's accuracy falls far short of such a shift in scientific archetypes. To earn the right to a *Frye* hearing on previously accepted scientific evidence, the party opposing its admissibility must preliminarily demonstrate that the method "is no longer accorded general scientific acceptance." *State v. Esser*, 205 Ariz. 320, 324, ¶ 11, 70 P.3d 449, 453 (App. 2003).[8] *See generally* Bert Black et al., *Science and the Law in the Wake of* Daubert*: A New Search for Scientific Knowledge*, 72 Tex. L. Rev. 715 (1994) (discussing means of establishing scientific acceptance). *Cf. State v. Harris*, 152 Ariz. 150, 152, 730 P.2d 859, 861 (App. 1986) (to be entitled to a *Frye* hearing, a party opposing the scientific method must be "supported by authorities indicating that there may not be general scientific acceptance of the technique employed."). In *Esser*, we said that it is not enough to produce scientific opinion challenging the accuracy of the evidence. 205 Ariz. at 324, ¶ 12, 70 P.3d at 453. "The question is not whether the scientific community has concluded that the scientific principle or process is

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[8] We apply the de novo standard of review to this proposition, the same as that applied to review the opposite proposition: "[W]e conduct a de novo review to determine whether a scientific principle used as a basis for expert testimony is generally accepted in the relevant scientific community." *Bible*, 175 Ariz. at 578, 858 P.2d at 1181.

absolutely perfect, but whether the principle or process is generally accepted to be capable of doing what it purports to do." *Id.* (internal quotations and citation omitted).

¶14 Defendant's attack on GC/MS did no more than demonstrate that test procedures or interpretation of test results can be faulty.[9] But these are not *Frye* issues, because they relate to the application of the science and not its validity. And any argument that the scientific method is not infallible goes to weight, not admissibility. *See Esser,* 205 Ariz. at 324, ¶ 13, 70 P.3d at 453 (challenge to accuracy of breath alcohol testing device goes to weight of test results, not admissibility under *Frye*).

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[9] Even that is a generous view of Defendant's evidence. The sole article on which Defendant relied states: "Disputes have erupted between prominent toxicologists and laboratory scientists as to the validity and interpretation of the data presented." Wu, *supra*, 44 J. Forensic Sci. at 516. But this statement does not refer to GC/MS tests. It only refers generally to "toxicological analyses and interpretations of blood, urine, and other specimens for drugs of abuse." *Id.* At most, the authors caution that test protocols must be observed and results properly interpreted:

> Most toxicologists consider GC/MS as the "gold standard" for forensic testing, and most attorneys consider results as irrefutable. However, GC/MS can have limitations depending upon the mode of operation, the experience of the operator performing the test, and the toxicologist interpreting the results. Data can be manipulated to arrive at an erroneous conclusion.

Id. at 521.

¶15 In summary, the superior court was not required to conduct a *Frye* hearing. Neither the absence of prior approval of GC/MS in reported Arizona opinions nor Defendant's attack necessitated a *Frye* hearing. Defendant failed to show either that the challenged evidence was a novel scientific method or was a formerly accepted method newly fallen into disrepute in the scientific community.

¶16 Defendant's second evidentiary challenge focuses on Dr. Kelly's opinion testimony. Dr. Kelly testified that, in his opinion, Defendant was impaired by marijuana at the time of the collision. Defendant argues that a *Frye* hearing was required to admit this opinion evidence.

¶17 A *Frye* hearing was not required to admit opinion evidence of this nature. Dr. Kelly opined that the levels of THC or its metabolites found in Defendant's body signify impairment of his ability to drive a motor vehicle safely. His testimony relied on no novel scientific principles. Instead, he provided an opinion based on his knowledge and experience as a forensic toxicologist. Such testimony is subject not to *Frye*, but to the general rules of admissibility regarding expert opinion evidence.

> The admissibility of such testimony, if challenged, is governed by the Arizona Rules of Evidence including Rule 702 (testimony must assist trier of fact), Rule 703 (data upon which expert bases opinion must be of "a type reasonably relied upon by experts in the particular field"), and Rule 403 (Relevant

> evidence may be excluded if its "probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury.").

State ex rel. Romley v. Fields, 201 Ariz. 321, 328, ¶ 23, 35 P.3d 82, 89 (App. 2001) (footnote and citation omitted).

¶18 Dr. Kelly testified that when marijuana is ingested, the concentration of THC in the blood increases rapidly, peaks, and then decreases rapidly to an undetectable level. However, the level of THC metabolites increase as the body processes the THC. The metabolites are detectable in the blood long after THC cannot be found. The absence of THC in the blood does not mean that the body is unaffected, however. Even when THC is no longer detectable in the blood, it remains for a time in the nervous system and continues to affect the user. It affects judgment, the ability to think, and the ability to solve problems. It can make the ability to perform multiple tasks, such as those performed while driving, difficult. Adverse effects endure as long as twenty-four hours after consumption.

¶19 Defendant argues that the superior court erroneously denied his request for a *Frye* hearing because the effects of marijuana were a matter of "human behavior," not scientific theory. That argument was squarely rejected by our supreme court in *Logerquist*, which held that expert testimony based on observations of behavior are not subject to a *Frye* test. 196 Ariz. at 480, ¶ 30, 1 P.3d at 123. Defendant also contends that Dr. Kelly's

testimony that Defendant was impaired at the time of the accident was based solely on "his interpretation and extrapolation of the results of a scientific process, GC/MS." That the data upon which Dr. Kelly based his opinion were obtained scientifically does not render his opinion inadmissible or subject to *Frye* unless such use were itself a novel technique. *See State v. Tankersley*, 191 Ariz. 359, 364-65, ¶ 14, 956 P.2d 486, 491-92 (1998) (new application of scientific principle is subject to *Frye*).

¶20 Defendant did not demonstrate that using test results and observed behavior to draw inferences about the effect of the drug on behavior was novel. Dr. Kelly did not, for example, utilize a formula that purports to relate quantities of THC metabolites with particular levels of impairment. Use of a mathematical formula to correlate test results with degree of impairment might well be a novel technique. But the record in this case reflects neither that Dr. Kelly relied on such a formula nor that such a formula is a new scientific method of analysis. On the contrary, Dr. Kelly repeatedly testified that a specific blood level of THC or its metabolites cannot be correlated either to a level of impairment in general or to a level of driving impairment in particular.

¶21 Instead, Dr. Kelly relied upon his experience and knowledge of these facts: (1) the recency of Defendant's ingestion of marijuana; (2) police reports describing the collision and Defendant's behavior consistent with marijuana impairment; and (3)

published studies relating consumption of marijuana and impairment of driving ability for as long as three hours later. His opinions therefore were admissible under Rules 702 and 703 of the Arizona Rules of Evidence. *See Logerquist*, 196 Ariz. at 477-78, ¶ 23, 1 P.3d at 120-21. *See also State v. Hyde*, 186 Ariz. 252, 276, 921 P.2d 655, 679 (1996) (admission of expert testimony is reviewed for abuse of discretion). The jury was entitled to hear his opinion about Defendant's impairment, and then give it the weight the jury believed that testimony merited.[10] The superior court did not abuse its discretion in refusing to hold a *Frye* hearing before admitting Dr. Kelly's opinion testimony.

¶22 Finally, Defendant argues that an improper jury instruction denied him a fair trial because it effectively shifted the burden of proof to him. The trial court gave the following jury instruction: "The defendant is not required to produce evidence of any kind. The decision whether to produce any evidence is left to the defendant acting with the advice of an attorney. The defendant's failure to produce any evidence is not evidence of

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[10] Unlike the test results produced by the GC/MS analysis, expressed with an exquisite precision measured in nanograms, the opinion of Dr. Kelly was not "scientific evidence [that] is a source of particular judicial caution. Because 'science' is often accepted in our society as synonymous with truth, there is a substantial risk of overweighting by the jury." *Bible*, 175 Ariz. at 578, 858 P.2d at 1181 (internal quotations and citations omitted). This testimony was ordinary expert opinion, subject to admissibility challenges by Defendant on the bases provided by the rules of evidence and to arguments to the jury on the weight to be accorded to the evidence.

guilt." Defendant concedes that he made no objection below, but asks us to review for fundamental error. *See State v. Schrock*, 149 Ariz. 433, 440, 719 P.2d 1049, 1056 (1986).

¶23 Although we fail to see how this instruction placed any burden on Defendant, Defendant waived his claim of error by requesting the following instruction:

> The State must prove guilt beyond a reasonable doubt with its own evidence. The defendant is not required to produce evidence of any kind. The decision on whether to produce any evidence is left to the defendant acting with the advice of an attorney. The defendant's failure to produce any evidence is not evidence of guilt.

With the exception of the exclusion of the first sentence and the word "on," the instruction given to the jury is identical to that sought by Defendant.[11]

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[11] The superior court also gave the following instruction on reasonable doubt:

> The State has the burden of proving the defendant guilty beyond a reasonable doubt. This means the State must prove each element of the each charge beyond a reasonable doubt. In a civil case it is only necessary to prove a fact is more likely true than not or that its truth is highly probable. In a criminal case such as this the State's proof must be more powerful than that. It must be beyond a reasonable doubt. Prove [sic] beyond a reasonable doubt is proof that leaves you firmly convinced of the defendant's guilt.
>
> There are very few things in this world that we know with absolute certainty and in a criminal case the law does not require proof that overcomes every doubt. If based on your

¶24 The instruction was not discussed or otherwise addressed in the record. The only source for this instruction is Defendant's request.

¶25 When a party requests a jury instruction, that party waives the right to challenge the instruction on appeal, even if the instruction is erroneous. *State v. Logan*, 200 Ariz. 564, 565, ¶ 8, 30 P.3d 631, 632 (2001). In such a case, we do not consider whether any alleged error is fundamental. *Id.* at 565-66, ¶ 9, 30 P.3d at 632-33.

¶26 Accordingly, we affirm Defendant's convictions and sentences.

JEFFERSON L. LANKFORD, Presiding Judge

CONCURRING:

DONN KESSLER, Judge

DANIEL A. BARKER, Judge

> consideration of the evidence, you're firmly convinced the defendant is guilty of a crime charged, you must find him guilty. If on the other hand you think there's a real possibility the defendant is not guilty, you must give him the benefit [of] the doubt and find him not guilty.