

## CASE NOTE

### **SPLITTING HAIRS: AYTUGRUL v THE QUEEN\***

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*At first glance, amidst contemporary popular suspicion of the law's onerous safeguards in favour of the accused, it may appear surreal, quixotic or even wilfully provocative to split hairs over the presentation of DNA evidence in criminal trials — particularly in cases, as below, in which all parties accept the expression of that evidence as mathematically correct and, in its own right, highly persuasive. Yet the clash of established behavioural science with uniform Australian evidence legislation and traditional expectations of jurors gives rise to questions which strike at the heart of the values of criminal law. In *Aytugrul v The Queen* (2012) 247 CLR 170, The High Court declined the appellant's invitation to delve into psychological research on the effects of the 'exclusion percentage' on a juror's subconscious mind. Dubious from the outset about the distinction between two alternative expressions of the same mathematical value, the Court found that the 'exclusion percentage' was not unfairly prejudicial as it was mitigated by prosecutorial and judicial explanation. Above all, the 'exclusion percentage' was salvaged by its presentation alongside the less problematic 'frequency ratio'. However, even if the exclusion percentage adds no further probative value beyond the 'frequency ratio', the High Court preferred to analyse its merit on its own terms, in isolation. This case note draws on Heydon J's discussion of a contrasting American decision, wide-ranging empirical studies and the policy of the law of evidence to argue that DNA evidence communicated as an 'exclusion percentage' should be excluded from criminal trials.*

#### **I THE CASE AT TRIAL**

Yusuf Aytugrul was convicted of murder in the Supreme Court of New South Wales on circumstantial evidence, including the results of a mitochondrial DNA test of a hair found on the victim's thumbnail.<sup>1</sup> The expert witnesses reported that the DNA of the accused matched the hair follicle. They also agreed about the prevalence of that DNA profile in the general population. The latter statement was expressed both as a 'frequency ratio' of one in 1,600 (the average pool of people in

\* *Aytugrul v The Queen* (2012) 247 CLR 170 ('*Aytugrul*').

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<sup>1</sup> *R v Aytugrul* [2009] NSWSC 275.

which one would share the same DNA profile) and also in terms of an ‘exclusion percentage’ of 99.9 per cent (the proportion of the population who do not share this DNA profile).

## II THE HIGH COURT APPEAL

Aytugrul appealed on the basis that ‘the DNA evidence being expressed as exclusion percentages should have been rejected’ pursuant to ss 135 or 137 of the *Evidence Act 1995* (NSW), because it was ‘unfairly prejudicial’.<sup>2</sup> The majority of the New South Wales Court of Criminal Appeal dismissed his case, with McClellan CJ at CL in dissent.<sup>3</sup> The High Court gave leave to appeal but unanimously affirmed the decision that ‘[n]either s 137 nor s 135 ... was engaged’.<sup>4</sup> However, as Heydon J observed, important evidence of the effects of exclusion percentages on jurors ‘was not relied on by either party [at trial] ... and was not raised in argument for their consideration’ or tendered to the court.<sup>5</sup> Given the ever-expanding role of DNA testing in the criminal justice system, this intricate dilemma is bound to recur.

### A ‘Slicing Up’ the Evidence: The Probative Value of the Exclusion Percentage

Key to Aytugrul’s appeal was his argument that the ‘incremental probative value’ of expressing the evidence as an exclusion percentage, as opposed to a frequency ratio, was ‘minimal’.<sup>6</sup> That is, once the frequency ratio was known, any additional meaning attributable to the exclusion percentage was only the subliminal rounding up of 99.9 per cent to 100 per cent. In criminal proceedings, s 137 demands that ‘the court must refuse to admit evidence adduced by the prosecutor if its probative value is outweighed by the danger of unfair prejudice to the defendant’.<sup>7</sup> Hence, the appellant submitted s 137 ‘would require exclusion if there was *any* risk of the jury giving more weight to the [exclusion] percentage evidence than it deserved’.<sup>8</sup>

The High Court was not impressed by this putative partition of the evidence. In the leading judgment, French CJ, Hayne, Crennan and Bell JJ noted that ‘[g]iven the mathematical equivalence of the two statements, there may be some doubt about [the argument’s] validity’.<sup>9</sup> Heydon J also dealt with this point in brief,

2 *Aytugrul v The Queen* (2010) 205 A Crim R 157, 169 [63].

3 See *Aytugrul* (2012) 247 CLR 170, 171.

4 *Aytugrul* (2012) 247 CLR 170, 176 [6].

5 *Ibid* 199 [66], quoting party submissions.

6 *Ibid* 185 [25].

7 *Evidence Act 1995* (NSW) s 137: provisions of the NSW Act largely mirror those of other states after the enactment of uniform evidence law around Australia.

8 *Aytugrul* (2012) 247 CLR 170, 185 [25], quoting party submissions (emphasis in original).

9 *Ibid* 185 [27].

considering the proposition ‘highly questionable’.<sup>10</sup> Yet Andrew Ligertwood distinguishes clearly between various restatements of the same mathematical fact: He concludes that ‘[i]t makes greater sense to express probative weight in the inductive terms’ appropriate to the standard of proof in criminal law.<sup>11</sup> He is not alone. In Europe, a ‘position statement’ of many forensic institutions affirmed that the likelihood ratio (inverse but analogous to the frequency ratio) was ‘the most appropriate foundation for assisting the court in establishing the weight that should be assigned to ... [the forensic examiner’s] observations’.<sup>12</sup> All are agreed that, as Simpson J (with whom Fullerton J agreed) held on appeal, ‘some formulations have a greater educative force or persuasive appeal than others’.<sup>13</sup> David Hamer further demonstrates this by reference to probability and odds scales — he argues that ‘mathematical equivalence between [frequency ratios] ... and exclusion percentage[s] are exaggerated and unsophisticated’.<sup>14</sup> The leading judgment’s final word on the matter — ‘the probative value of the exclusion percentage was necessarily the same as that of the frequency ratio’ — appears, then, to favour a dubious legal fiction over the acknowledged reality of behavioral science.<sup>15</sup> The appellant’s argument has more credence than the High Court attributed to it, and it is worth following to its logical conclusion.

As counsel for the appellant submitted, the exclusion percentage ‘is, literally speaking, a different statement to ... [the frequency ratio], regardless of whether the substantive “content” of the two statements is the same’.<sup>16</sup> More importantly, the various formulations of the same mathematical statement are empirically proven to have divergent effects on jurors. This is because, according to an authority on probabilistic formulations, Jonathan J Koehler, ‘people think heuristically rather than probabilistically’.<sup>17</sup> Unlike machines utilising algebraic computations, tenets of logic and probability theory, jurors ‘evaluate quantitative evidence via mental shortcuts and other rules of thumb’.<sup>18</sup> The *Evidence Act*’s dictionary definition of probative value emphasises ‘the extent to which the evidence could *rationality* affect’ an assessment by the trier of fact.<sup>19</sup> In light of this focus on rationality, in cases where it sits alongside the equivalent frequency ratio, the exclusion percentage seems bereft of any additional probative value.

10 Ibid 198 [64].

11 Andrew Ligertwood, ‘Can DNA Evidence Alone Convict an Accused?’ (2011) 33 *Sydney Law Review* 487, 507.

12 Editorial, ‘Expressing Evaluative Opinions: A Position Statement’ (2011) 51 *Science and Justice* 1, 1.

13 *Aytugrul v The Queen*, (2010) 205 A Crim R 157, 187 [164].

14 David Hamer, ‘Expected Frequencies, Exclusion Percentages and “Mathematical Equivalence”: The Probative Value of DNA Evidence in *Aytugrul v The Queen*’ (2013) 45 *Australian Journal of Forensic Sciences* 271, 272.

15 *Aytugrul* (2012) 247 CLR 170, 185 [28] (emphasis altered).

16 Ibid 198 [64], quoting party submissions.

17 Jonathan J Koehler, ‘The Psychology of Numbers in the Courtroom: How To Make DNA-Match Statistics Seem Impressive or Insufficient’ (2001) 74 *Southern California Law Review* 1275, 1299.

18 Ibid.

19 *Evidence Act 1995* (NSW) dictionary pt 1 (emphasis added).

## **B Strange Bedfellows and Unfair Prejudice: Mathematical Probabilities and the Law**

If it is accepted that two expressions of the same mathematical fact can be separated and thus the second can be considered to have ‘minimal’ probative value beyond the first, it is necessary to consider the other side of the coin — is the second form of the evidence ‘unfairly prejudicial’ to the accused?<sup>20</sup> The leading judgment of the High Court found that the evidence was ‘adverse to the appellant but ... in no sense unfairly prejudicial’, primarily because it was mitigated by an explanation.<sup>21</sup> Meanwhile, Heydon J acknowledged that the evidence was conceptually difficult but remained confident that ‘any criminal jury of twelve is likely to contain at least one juror capable of realising, and demonstrating to the other jurors, that the frequency estimate was the same as the exclusion percentage’.<sup>22</sup> In the context of an appeal on the sensitivity of applying probabilities to criminal cases, this is a strikingly casual remark. As McClellan CJ at CL rightly held, the ‘numerous errors’ in citing the relevant exclusion percentage by experts, counsel and the judge in the *Aytugrul* trial do not inspire faith in the ability of the average jury.<sup>23</sup> Hamer catalogues five different exclusion percentages quoted at the trial, ranging from 99.5 per cent (or one in 200) to 99.99 per cent (or one in 10,000).<sup>24</sup> Hamer also employs these figures as examples of the ‘considerable’ gulf between frequency ratios and exclusion percentages, as ‘[t]he highest frequency ... is 50 times greater than the lowest’.<sup>25</sup> Even McClellan CJ at CL himself fell into mathematical error when discussing *R v JCG*,<sup>26</sup> adding a decimal place in one number and losing it in another — inadvertently supporting his own stance on the complexity of probabilistic DNA evidence.<sup>27</sup>

Heydon J also listed several ‘post-tender events’ such as the trial judge’s warning against committing the ‘prosecutor’s fallacy’, which was heeded by the prosecution and its witnesses, who employed the exclusion percentage as only ‘a minor aspect of the case’.<sup>28</sup> However, as his Honour acknowledged, these eventualities were hardly foreseeable at the introduction of the ‘exclusion percentage’, and whilst they count against *Aytugrul*’s appeal, they scarcely touch the general problem at the heart of his case.<sup>29</sup>

That problem is the underlying tension in applying the inductive reasoning required at criminal law to mathematically expressed DNA evidence. The statistician recognises that ‘[t]oday, all scientific knowledge is conceived as

20 *Evidence Act 1995* (NSW) ss 135, 137.

21 *Aytugrul* (2012) 247 CLR 170, 184 [24] (emphasis altered).

22 *Ibid* 203 [75].

23 *Aytugrul v The Queen* (2010) 205 A Crim R 157, 168 [59].

24 Hamer, above n 14, 273.

25 *Ibid* 274.

26 (2001) 127 A Crim R 493.

27 See *Aytugrul v The Queen* (2010) 205 A Crim R 157, 169 [67] (in the figure of 0.00001%), 171 [75] (in the figure of 99.999%).

28 *Aytugrul* (2012) 247 CLR 170, 204 [75].

29 *Ibid* 204 [75].

inherently probabilistic’ and does not aspire to certainty, only to revealing the degree of our ignorance.<sup>30</sup> The juror, on the other hand, must focus on excluding any reasonable doubt — at what percentile can one do so? The law has never accepted that criminal proof is a mathematic exercise; trial judges are prohibited from explaining the standard of proof to the jury in percentage terms.<sup>31</sup> This theory of inductive reasoning, ably expounded by Ligertwood, implicitly underpins McClellan CJ at CL’s dissent. His Honour cited *R v GK*<sup>32</sup> and *R v JCG*<sup>33</sup> in finding that the exclusion percentage ‘invited a subconscious “rounding-up” to 100 [per cent]’ which amounted to unfair prejudice.<sup>34</sup> As Ligertwood put it, ‘[t]o express the match in terms of the proportion of persons ... who would not match the sample appears simply unhelpful’ — and lacking in inductive logic.<sup>35</sup>

### **C Doubling up on the Numbers: A Prosecutorial Right, or Wrong?**

Even if the exclusion percentage is of minimal probative value and has the potential to cause unfair prejudice, is it not saved by the presence of the frequency ratio alongside it and a clear explanation of the relationship between them? Psychologists Martire, Kemp and Newell argue that ‘inductive logic does not permit categorical or certain conclusions that a trace ... [the DNA of the hair] originated from a specific known source ... [the accused]’.<sup>36</sup> Ligertwood agrees that ‘[t]he very expression of the evidence in these terms is unnecessary and does no more than to create a prejudicial overlay’, which can be safely avoided by relying on the frequency ratio.<sup>37</sup> Here, perhaps, Ligertwood strays into micromanaging the prosecutorial case. It is hard to argue with his contention that ‘[i]t makes greater sense to express probative weight in the inductive terms appropriate to the application of the individualised criminal standard of proof’.<sup>38</sup> Greater sense, however, it might be asked, to whom?

According to the leading judgment of the High Court, ‘[t]here was no risk of rounding the figure of 99.9 per cent to the certainty of 100 per cent’<sup>39</sup> because, ‘both the frequency ratio and the manner in which the exclusion percentage had been derived ... were ... explained in evidence to the jury’, eliminating the unfair

30 Simon A Cole and Rachel Dioso-Villa, ‘CSI and its Effects: Media, Juries, and the Burden of Proof’ (2007) 41 *New England Law Review* 435, 468, quoted in Ligertwood, above n 11, 496.

31 See *Chedzey v The Queen* (1987) 30 A Crim R 451; *R v Flesch* (1986) 7 NSWLR 554; *R v Cavkic* (2005) 12 VR 136, all cited in Ligertwood, above n 11, 501 n 41.

32 (2001) 53 NSWLR 317.

33 (2001) 127 A Crim R 493.

34 *Aytugrul v The Queen* (2010) 205 A Crim R 157, 176 [99].

35 Ligertwood, above n 11, 505 (emphasis altered).

36 Kirsty A Martire, Richard I Kemp and Ben R Newell, ‘The Psychology of Interpreting Expert Evaluative Opinions’ (2013) 45 *Australian Journal of Forensic Sciences* 305, 305.

37 Ligertwood, above n 11, 507.

38 *Ibid.*

39 *Aytugrul* (2012) 247 CLR 170, 184 [24].

prejudice.<sup>40</sup> Given that it is common ground that the danger of unfair prejudice lies in the subconscious, it seems optimistic to put so much faith in a trial judge's explanation to cancel it out. The leading judgment found the appellant's approach 'unbalanced' — it assessed probative weight with regard to other evidence, but assessed the danger of unfair prejudice in isolation.<sup>41</sup> This, however, is at odds with McClellan CJ at CL's conclusion that the trial judge could not possibly have adequately directed the jury because '[t]he exclusion percentage figures were too compelling'.<sup>42</sup> His Honour examined the prejudicial evidence in context and held that no explanation could have salvaged it.<sup>43</sup>

Eleven years earlier, the High Court held in *Smith v The Queen*<sup>44</sup> that because the policemen's 'assertion of identity was founded on material no different from the material available to the jury' it was 'not evidence that could rationally affect the assessment'.<sup>45</sup> Here, the frequency ratio constitutes the evidence as appropriately expressed in criminal law, which the exclusion percentage repeats, metaphorically donning the police uniform for added persuasive authority. Just as research has concluded that juries give police evidence more weight than it deserves,<sup>46</sup> so too does the use of certain statistical formulations, with extra subliminal impact, distract the jury from its task. Indeed, Gary Edmond describes as 'bizarre' the disjuncture between judicial readiness to accept opinion evidence and unwillingness to entertain the cognitive science which could 'inform trial personnel about the way lay people understand complex forms of information' in reality.<sup>47</sup> The prosecution should not be entitled to rephrase the evidence as an exclusion percentage.

### **D How Much Weight in the Saddlebags? The Risk of Handicapping the Prosecutor**

If the exclusion percentage does not add any probative value because the frequency ratio is already known, why should the prosecution be compelled to lead the DNA evidence as a frequency ratio in the first place? Simpson J, with whom Fullerton J agreed, was 'at a loss to understand why a jury ought not to be assisted by having the evidence couched in the language most likely to be meaningful to lay recipients'.<sup>48</sup> Her Honour's judgment cited the powerful words of Mason P in *R v GK* — '[i]t is not the judicial function to give the accused a fighting chance of gaining an acquittal ... [t]he admissibility of evidence is not in an inverse ratio to

40 Ibid 186 [30].

41 Ibid 185 [29].

42 *Aytugrul v The Queen* (2010) 205 A Crim R 157, 176 [99].

43 Ibid 176 [96]–[99].

44 (2001) 206 CLR 650 ('*Smith*').

45 Ibid 655 [11].

46 See, eg, Gary L Wells and Amy L Bradfield, 'Distortions in Eyewitnesses' Recollections: Can the Postidentification-Feedback Effect Be Moderated?' (1999) *Psychological Science* 10 (1999) 138, 138.

47 Gary Edmond, 'Expert Evidence in Reports and Courts' (2013) 45 *Australian Journal of Forensic Sciences* 248, 255.

48 *Aytugrul v The Queen* (2010) 205 A Crim R 157, 187 [170].

its probative effect'.<sup>49</sup> Indeed, the opposite is true. Are the prosecution not entitled to state their case in the most advantageous terms? McClellan CJ at CL would answer that where DNA evidence 'strongly implicates the accused, it will speak for itself',<sup>50</sup> echoing the reasoning in *Smith*.<sup>51</sup> He cites the prosecution's duty to present all evidence, particularly complex expert evidence, in a manner fair to the accused.<sup>52</sup>

Whilst the leading judgment gave it short shrift, Heydon J analysed extensively the 'extremely interesting' argument that the exclusion percentage added minimal probative value in comparison with other available evidence.<sup>53</sup> His Honour referred to *Old Chief v United States*<sup>54</sup> where a majority of the Supreme Court of the United States considered it wrong to examine the probative value of the evidence tendered in isolation. The majority held that if an alternative piece of evidence had 'substantially the same or greater probative value but a lower danger of unfair prejudice, sound judicial discretion' would exclude the prosecutor's preferred version of the evidence if it was 'substantially outweighed by unfairly prejudicial risk'.<sup>55</sup> The majority also made allowance for the 'need for evidentiary richness and narrative integrity in presenting a case', especially when shouldering the burden of proof as prosecutor.<sup>56</sup> Heydon J was at pains to contrast the American context with Australian statutory construction, before ultimately deciding that it was not necessary to express an opinion on the matter.<sup>57</sup> A 2005 Australian Law Reform Commission report was not so restrained, stating that 'where there is a paucity of evidence on a relevant issue, the probative value of the evidence ... is likely to be higher than it otherwise would be'.<sup>58</sup> Necessarily, then, if buried in a wealth of similar evidence, the probative value is lower and the evidence more likely to be excluded. On this basis, it is submitted that as a matter of policy, where empirical evidence proves that jurors give excessive weight to certain evidence such as exclusion percentages, s 137 should operate with a holistic view to the entirety of the evidence as in *Old Chief*.

### III CONCLUSION: THE ODDS ON DNA PROBABILITIES IN FUTURE TRIALS

DNA test results will provide increasingly critical identification evidence in criminal trials for the foreseeable future. As Angela van Daal and his Honour

49 (2001) 53 NSWLR 317, 326 [37].

50 *Aytugrul v The Queen* (2010) 205 A Crim R 157, 176 [98].

51 *Smith v The Queen* (2001) 206 CLR 650, 656–7 [14]–[16].

52 *Aytugrul v The Queen* (2010) 205 A Crim R 157, 176 [98].

53 *Aytugrul* (2012) 247 CLR 170, 189–90 [41]–[42].

54 519 US 172 (1997).

55 *Ibid* 182–3.

56 *Ibid* 183.

57 *Aytugrul* (2012) 247 CLR 170, 192–4 [47]–[51].

58 Australian Law Reform Commission, *Uniform Evidence Law Report*, Report No 102 (2005) 556 [16.15], citing *R v Lockyer* (1996) 89 A Crim R 457.

Andrew Haesler put it, '[t]he potential probative force ... means great care must always be taken in the presentation of the DNA evidence'<sup>59</sup>— with great persuasive power comes great responsibility. McClellan CJ at CL acknowledged in *Aytugrul v The Queen* that the proper reaction is 'not to banish all statistical evidence from the courtroom', but rather 'to rationally determine the probabilistic formulations which are appropriate for use in a criminal trial'.<sup>60</sup>

Of all the arcane quirks of the law, the admissibility of DNA evidence in the form of exclusion percentages is admittedly an esoteric candidate for reform. In most cases, the shortest path to probative value and the safest defence from unfair prejudice lies in the art of advocacy. In general, an effective counsel should have licence and the ability to present truthful evidence in the words or numbers that suit his argument. If the prosecution emphasises the exclusion percentage, the defence may prefer to deal in frequency ratios. However, a formidable body of research demonstrates that jurors give excessive weight, for recognised psychological reasons, to certain formulations of statistical evidence.<sup>61</sup> This knowledge ought to be a clarion call for legislative reform or a High Court precedent to exclude the subliminal impact of high exclusion percentages from evidence in criminal cases.

59 Angela van Daal and Judge Andrew Haesler, 'DNA Evidence: Current Issues and Challenges' (2011) 23 *Judicial Officers' Bulletin* 55, 59.

60 (2010) 205 A Crim R 157, 177 [102].

61 See, eg, Jonathan J Koehler, Audrey Chia and Samuel Lindsey, 'The Random Match Probability in DNA Evidence: Irrelevant and Prejudicial?' (1995) 35 *Jurimetrics Journal* 201; Mark Findlay and Julia Grix, 'Challenging Forensic Evidence? Observations on the Use of DNA in Certain Criminal Trials' (2003) 14 *Current Issues in Criminal Justice* 269; Russell B Korobkin and Thomas S Ulen, 'Law and Behavioural Science: Removing the Rationality Assumption from Law and Economics' (2000) 88 *California Law Review* 1051; Michael J Saks and Jonathan J Koehler, 'The Individualization Fallacy in Forensic Science Evidence' (2008) 61 *Vanderbilt Law Review* 199.