

**REPORT ON SCIENTIFIC ISSUES
IN THE CASE OF OKLAHOMA V. DANIEL K. HOLTZCLAW
BY AN INTERNATIONAL PANEL OF FORENSIC EXPERTS**

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for Case No. F-2016-62
in the Oklahoma Court of Criminal Appeals

DANIEL K. HOLTZCLAW, *Appellant*,

v.

THE STATE OF OKLAHOMA, *Appellee*.

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was allegedly orally sodomized by Mr. Holtzclaw through the unzipped fly of his buckled uniform pants. (Tr. 501, 511)

A few hours later on the morning of June 18, 2014, Ms. C2 reported to police that an officer had forcibly orally sodomized her after stopping her vehicle. A Sexual Assault Nurse Exam (SANE) of Ms. C2 occurred within several hours of the alleged sexual assault. (Tr. 4038)

On the afternoon of June 18, 2014, two OCPD sex crimes detectives, one female and the other male, interrogated Mr. Holtzclaw for approximately two hours, handing him pens to fill out forms. (State's Exhibit #14) At the end of the interrogation, the male detective inserted his bare hand in an evidence bag into which Mr. Holtzclaw then placed both his dark navy blue uniform pants (Item #17) and black Velcro belt in the keepers (Item #18). (Original Record (O.R.) p. 177) Only Mr. Holtzclaw's uniform pants and Velcro belt were collected as evidence. *Id.*

Ms. C2's SANE kit, as testified by the OCPD forensic analyst, "unfortunately in this case" came back negative without any evidence of Mr. Holtzclaw's DNA in or around Ms. C2's mouth. (Tr. 4038) No fingerprints or DNA supported Ms. C2's account that she and Mr. Holtzclaw placed their hands on top of his patrol car. (Tr. 482, 508, 1095-96)

The OCPD forensic analyst observed nothing suspicious on the fly of the uniform pants by using a very bright light and a magnifying glass. (Tr. 4084) She did not test the uniform pants for body fluids or use an Alternate Light Source to identify whether latent stains were present. (Tr. 4078-79, 4084) Instead, she proceeded directly to swabbing only the outside and inside of the fly of Mr. Holtzclaw's uniform pants for DNA. (Tr. 4028-30, 4084)

The forensic analyst obtained four DNA samples, items #17Q1 and #17Q2 (in June of 2014), and then items #17Q3 and #17Q4 more than a year later (in September of 2015), by

“vigorously” rubbing wet cotton swabs up and down the full length of the fly of the uniform pants on four different stretches of fabric alongside the zipper: the outer, left-hand surface of the fly (#17Q1); an inner, right-hand fabric flap that is revealed when the zipper is unzipped (#17Q2); and two interior stretches of fabric to the left and right of the zipper (#17Q3 and #17Q4, respectively). (Tr. 4032-33, 4040, 4062); Bench Notes of OCPD forensic analyst.

The purified DNA is assumed to derive from epithelial cells, which form the skin layer on the outside of the body including inside orifices such as mouth and vagina, because the DNA purification method that was used would not extract DNA from sperm and there was no reason to believe that the DNA derived from blood or muscle. (*See* Tr. 2699, 2700-01, 4075)

The only forensic evidence linking Mr. Holtzclaw to any of the complainants in the entire trial was a DNA profile, ultimately matched to the teenager Ms. C1 (O.R. 182, 253), that was obtained from the fly of Mr. Holtzclaw’s uniform pants in the four DNA samples, which included mixtures of DNA from at least several individuals. Item #17Q1 was an indistinguishable mixture of DNA from at least 3 people and included all the alleles found in Ms. C1’s DNA profile. (O.R. 187, 190) Items #17Q2 (with at least 3 contributors), #17Q3 (with at least 2 contributors), and #17Q4 (with at least 2 contributors) each had a clear and complete major profile that matched Ms. C1, while the minor contributor profiles had the possibility of allele drop-out. All four samples contained male DNA, although the forensic analyst testified that no evidence of male DNA was found in the items #17Q3 and #17Q4 (Tr. 4072) even though the quantification results on the OCPD qPCR Report for SD14-273 (10/1/2015) revealed its presence. The OCPD forensic analyst testified that Mr. Holtzclaw was excluded from being a contributor to all four DNA samples, when in fact the data were inconclusive. *Compare* (Tr.

4073) and (O.R. 182, 253, 255).

The OCPD forensic analyst informed the female detective early on with respect to June 18, 2014, the beginning of the investigation, that item #17Q2 contained the complete DNA profile of an unknown female major contributor. (Tr. 4045-46) This discovery led to a police investigation to search for the unidentified female (Tr. 423-24) by focusing only on possible consensual or criminal sexual transfer of DNA (10/2/14 Motion Hearing Tr. 16, 62).

The detectives suspected that the forcible oral sodomy allegation by Ms. C2 could be linked to an earlier sexual assault allegation against an unknown police officer by another woman, Ms. C9. (Exhibit #14; Tr. 3204, 3208-09) Ms. C9 was high on crack cocaine when she made an allegation against an unknown officer. (Tr. 3163-64) She had a mood disorder, multiple warrants, and a criminal history including drug use, prostitution arrests, and penitentiary escapes. (Tr. 3157, 3159, 3188) Ms. C9 could not positively identify her alleged assailant in a line-up (Tr. 3172) and recalled a date (Tr. 3212), a black and white patrol car color (Tr. 3302), and initially a location (Tr. 3159, 3175) that did not match the whereabouts and black color of Mr. Holtzclaw's patrol car. Eventually, it was discovered that Mr. Holtzclaw's patrol car was going faster than 25 mph at the location where Ms. C9 alleged he dropped her off, such that even the male detective admitted that "yes," she was lying about that. (Tr. 3239, 3291-92) (Mr. Holtzclaw was acquitted of Ms. C9's allegations.)

Despite these problems with Ms. C9's accusations, police used her background while developing a victim profile to search for the mystery female whose DNA was found on the fly of Mr. Holtzclaw's uniform pants. Although Ms. C2 had no warrants or drug convictions, an OCPD lieutenant created a victim profile by assuming that Mr. Holtzclaw had targeted African

American females with criminal histories and arrest warrants. (Tr. 2385-86) The lieutenant looked back through 6 months of police records prior to June 18, 2014. (Tr. 2397) He identified hundreds of women whose criminal histories had been checked by Mr. Holtzclaw, noting those whom Mr. Holtzclaw had also run for warrants, and then the lieutenant created a list containing “specifically names of black females” (Tr. 2385) “who had a drug history, prostitution history or a significant criminal history” (Tr. 2284, 2386-87). The lieutenant gave packets of the women’s information to the two sex crimes detectives to use to contact them. (Tr. 2399)

The detectives then contacted these women, telling them that police had “received a tip” that the women were “possibly sexually assaulted by an Oklahoma City police officer” who “was a really bad guy.” (Tr. 1975, 2218, 2250, 2273, 2322-23, 2999, 3517-18) The male detective admitted he could have told multiple interviewees that police had a lot of victims, a long list of women. (Tr. 2250, 2273) Police contacted more than 40 African American women with drug and prostitution histories and warrants. (Tr. 2269) While more than 33 women said nothing had happened (Tr. 2269), police ultimately obtained sexual assault allegations from 9 of the women.

When none of these women matched the unidentified female DNA profile, detectives then started looking at “every female he ran starting before he was put on administrative leave [...] and working backwards” to find a DNA match. (Tr. 3892) This process led to a tenth complainant, Ms. C1, the last complainant identified in the case, whose DNA matched the major contributor in samples from the fly of the uniform pants. (Tr. 3933-36)

After including the three women – Ms. C2, Ms. C9, and Ms. C11 – who made sexual assault allegations without being contacted first by police, the investigation of Mr. Holtzclaw resulted in a total of 13 complainants whose allegations went to trial. Other women and one man

transferred tertiarily from the neck of one individual (a donor) to cotton cloth that had been rubbed for 5 seconds on the donor's neck, then from that first cloth to the hands of a second person (the carrier), and finally from the carrier's hands to a second piece of cotton cloth. *See Helmus et al.* at 121, 124. DNA testing of the second cloth was able to provide the complete DNA profile of the original donor in 22% of the samples. *Id.*

Research by Cale *et al.*, first published online on Sept. 1, 2015, revealed that shaking hands with a second individual and then touching a knife can transfer the second individual's DNA, but not the handler's DNA, to the touched object. Cynthia M. Cale, Madison E. Earll, Krista E. Latham & Gay L. Bush, *Could Secondary DNA Transfer Falsely Place Someone at the Scene of a Crime?* 61 J. OF FORENSIC SCIENCES 196, 196 (2016). Other studies have obtained similar results. *See, e.g.*, Alex Lowe, Caroline Murray, Jonathan Whitaker, Gillian Tully & Peter Gill, *The Propensity of Individuals to Deposit DNA and Secondary Transfer of Low Level DNA from Individuals to Inert Surfaces*, 129 FORENSIC SCIENCE INT'L. 25, 33 (2002) ("The full DNA profile of one individual was recovered from an item that they had not touched while the profile of the person having contact with that item was not observed.").

The absence of visible staining on the fly of the uniform pants (Tr. 4084) was consistent with non-intimate DNA transfer. Vaginal stains may appear whitish or creamy, yet can be faint or not visible at all, and currently there are no commercial confirmatory tests for matter secreted specifically from the vagina. *See* JANE MOIRA TAUPIN & CHESTERENE CWIKLIK, *SCIENTIFIC PROTOCOLS FOR FORENSIC EXAMINATION OF CLOTHING* 133 (2010). However, recent research has revealed that after just two minutes of consensual sexual intercourse without ejaculation, stains are visible on men's underwear that they donned after intercourse, causing

their genitals to come into contact with the cloth of the underwear. *See Jones et al.* at 95. Based on these research results, there would be an expectation of visible staining on the fly of Mr. Holtzclaw's uniform pants if he had, as alleged, raped Ms. C1 for "about ten minutes" (Tr. 3773) through the unzipped fly of his buckled pants confiscated less than 24 hours later.

The complex DNA mixtures were typical of indirect transfer. Although Mr. Holtzclaw's trial defense attorney did not reveal this during the trial, the defense argument is additionally supported by the observation that the samples were mixtures of DNA from several individuals, which is typical of the complex DNA mixtures frequently found due to non-intimate DNA indirect transfer. *See* Mariya Goray, Ece Eken, R.J. Mitchell & Roland A.H. van Oorschot, *Secondary DNA Transfer of Biological Substances under Varying Test Conditions*, 4 FORENSIC SCIENCE INT'L: GENETICS 62 (2010) ("a biological substance that has been transferred multiple times, if detectable, will often appear as components of complex DNA profiles" from more than one individual because DNA may be present on the vectors on which it transferred or on the substrate from which the DNA is collected).

B. We are Concerned that the DNA Evidence's Probative Value was Reduced Further by the Omission of Critical Forensic Science Steps during Evidence Collection and Testing.

The probative value of the DNA evidence, which was low because it could be explained by non-intimate DNA indirect transfer, was reduced further because the State did not follow the crucial forensic science steps of developing, investigating, and testing alternative hypotheses during evidence collection and analysis to distinguish among three hypotheses that could explain the DNA evidence: DNA transfer in body fluid; non-intimate skin cell DNA transfer, such as via Mr. Holtzclaw's hands; contamination of the fly of the uniform pants. *See* JOHN O. SAVINO &

case. Identifying a fluid can impact the trial verdict, and therefore the first step of DNA profiling should be to examine the exhibits to detect the presence of body fluids and identify them by using light sources and chemical tests. *See* INTERPOL DNA MONITORING EXPERT GROUP, INTERPOL HANDBOOK ON DNA DATA EXCHANGE AND PRACTICE 30 (2nd ed. 2009); *see also* TAUPIN & CWIKLIK at 140 (“Methods for locating and sampling biological stains are essential to the successful interpretation of DNA analysis and identification of body fluids....”).

It is agreed that Mr. Holtzclaw and Ms. C1 had non-sexual contact. This is why the mere presence of a DNA profile cannot be attributed to sexual activity without supporting evidence of body fluid identification. Finding DNA on a suspect’s clothing “has an entirely different probative value when DNA originates from the epithelium” vs. body fluids. Joanna Jakubowska, Agnieszka Maciejewska & Ryszard Pawłowski, *mRNA Profiling in Identification of Biological Fluids in Forensic Genetics*, 87 PROBLEMS OF FORENSIC SCIENCES 204, 204 (2011).

3. The State did not investigate the source of unknown female and male DNA that could support the hypothesis of non-intimate DNA indirect transfer.

Discovering unexplained and unexpected DNA from a mixture of individuals, including at least one unidentified male, on the fly of Mr. Holtzclaw’s uniform pants required consideration of who may have contributed to the DNA samples and the chain of events that led to the DNA being present so that the likelihood of alternative scenarios could be assessed, yet both the State’s investigators and Mr. Holtzclaw’s trial defense attorney did not do this. *See* SAVINO & TURVEY at 321 (explaining that the meaning of DNA evidence “cannot be interpreted unless the conditions” of contact “and evidence transfer have been reconstructed carefully using other physical evidence”); *see also* Williamson at 4 (stating that when a male profile that does not match a suspect is obtained from a non-intimate skin cell DNA sample relating to a female

complainant, then the relevance of the male DNA to the case must be considered); Roland A.H. van Oorschot, Kaye N. Ballantyne & R. John Mitchell, *Forensic Trace DNA: A Review*, 1 INVESTIGATIVE GENETICS 1, 12 (2010) (explaining that police must make greater efforts to investigate the possible chain of events leading to DNA transfer).

The State omitted investigating whether Ms. C1's male and female friends, with whom she was stopped, could have contributed alleles to the DNA samples, which would support the scenario that non-intimate DNA from all three individuals transferred to Mr. Holtzclaw's hands when he questioned them. (Tr. 3801-03); *see also* Williamson at 4 (noting DNA "elimination samples" should be obtained from individuals who may have contributed to DNA mixtures).

4. We are concerned that the State's handling of the evidence could cause contamination that may have transferred DNA from Ms. C1 and others to the fly of the uniform pants.

Lastly, the DNA from the fly of the uniform pants had little probative value because the State did not undertake crucial and accepted forensic science steps to prevent the possibility of DNA contamination by investigators during evidence collection, storage, or examination. *See* Joel D. Lieberman, Terance D. Miethe, Courtney A. Carrell & Daniel A. Krauss, *Gold Versus Platinum: Do Jurors Recognize the Superiority and Limitations of DNA Evidence Compared to Other Types of Forensic Evidence?* 14 PSYCH. PUB. POL. & L. 27, 31 (2008) (explaining that police may contaminate evidence while collecting and storing an exhibit inappropriately); *see also* Oorschot *et al.* at 11 ("Contamination is a crucial issue in the analysis and interpretation of trace DNA."). Also, staff elimination DNA samples from the detectives and other investigators do not appear to have been compared with the DNA samples from the fly of the uniform pants.

Five possible routes can be identified by which DNA may have contaminated the fly of Mr. Holtzclaw's uniform pants. The trial defense attorney mentioned none of them.

First, alleles from unidentified individuals, including at least one male, could have arisen from the female and male sex crimes detectives during their interrogation of Mr. Holtzclaw due to secondary transfer via pens that they handed to him, after which he rubbed his pants frequently, ultimately touching his Velcro belt and possibly the fly of the uniform pants while unzipping them, as revealed in the interview video. (Exhibit #14)

Second, contamination of the uniform pants and belt may have occurred due to DNA transfer after the male detective violated proper evidence collection procedure by failing to wear DNA-free gloves and instead pushing his bare hand into the evidence bag before Mr. Holtzclaw placed his pants and belt in the bag. *Id.*; *see* SAVINO & TURVEY at 366 (DNA contamination).

Third, detectives violated standard procedures for evidence collection by packaging two items, the uniform pants (Item #17) and the belt (Item #18), in the same evidence bag, creating the potential for cross-contamination of DNA from Ms. C1 as well as other individuals from the belt to the fly of the uniform pants during transportation and storage. *See* SAVINO & TURVEY at 157; *see also* INTERPOL DNA MONITORING EXPERT GROUP at 27 ("Never pack several items/objects together.").

Fourth, DNA from Ms. C1 and other individuals that may have been present on less incriminating locations of the pants may have transferred to the fly within the evidence bag, or vice versa, since research demonstrates significant quantities of DNA often transfer from one area to another on the same exhibit or other exhibits inside a single bag. *See* Mariya Goray, Roland A.H. van Oorschot & John R. Mitchell, *DNA Transfer within Forensic Exhibit*

Packaging: Potential for DNA Loss and Relocation, 6 FORENSIC SCIENCE INT'L: GENETICS 158, 165-166 (2012).

Fifth, the photo taken by the OCPD forensic analyst of the uniform pants (State's Exhibit #392) shows that they were in contact with what appears to be a red brick surface in one corner of the photo, which raises contamination concerns because brick is not part of a lab bench. *See* Bianca Szkuta, Michelle Harvey, Kaye Ballantyne & Roland R.H. van Oorschot, *DNA Transfer by Examination Tools – a Risk for Forensic Casework?* 16 FORENSIC SCIENCE INT'L: GENETICS 246, 246 (2015) (demonstrating DNA contamination of evidence items via lab tools and gloves).

II. THE STATE MISINTERPRETED THE DNA ANALYSIS AND MADE ARGUMENTS THAT MISREPRESENTED THE DNA EVIDENCE FROM THE FLY OF MR. HOLTZCLAW'S UNIFORM PANTS.

As described in Mr. Holtzclaw's brief (p. 44), the State and its forensic analyst misrepresented the forensic evidence by arguing, incorrectly, that vaginal fluid was likely to be present and the speculative presence of undetected vaginal fluid (Tr. 4073, 4087-89) was supported by the discovery of DNA matching Ms. C1's profile, by incorrectly asserting that no male DNA was present in items #17Q3 and #17Q4 (Tr. 4072), and by incorrectly excluding Mr. Holtzclaw as a potential contributor to the four DNA samples from the fly of the uniform pants (Tr. 4059, 4072). The prosecutor also claimed facts not in evidence when he claimed in his closing statement that it was a "fact" that C1's DNA transferred in vaginal fluids. (Tr. 4307)

Mr. Holtzclaw's trial counsel neither forced the prosecution's DNA analysis errors to be revealed during cross-examination of the forensic analyst, nor objected to prosecutorial misrepresentations of the forensic evidence. Trial defense counsel did not make the forensic analyst admit that male DNA was present in all four samples from the fly of the uniform pants,

and so the implications of this DNA were never addressed. We are concerned that Mr. Holtzclaw's representation was therefore ineffective because criminal justice and DNA experts note that in order "to completely represent an individual incriminated by DNA evidence," defense counsel must "look behind the laboratory report to determine whether the lab's conclusions are well supported, and whether there is more to the story than the report tells." William C. Thompson, Simon Ford, Travis Doom, Michael Raymer & Dan E. Krane, *Evaluating Forensic DNA Evidence: Essential Elements of a Competent Defense Review*, Part 1, 27 THE CHAMPION 16, 19-21 (April 2003). Effective defense counsel must uncover, understand, and explain ambiguities in the DNA evidence, with one source of ambiguity being mixtures of DNA from several individuals because these "mixtures are difficult to interpret." *Id.*

However, the prosecutor's incorrect argument that the discovery of DNA matching Ms. C1 and the presumed absence of Mr. Holtzclaw's DNA together suggested the likely presence of vaginal fluid is a trial error that was preserved for appellate review, because the Court sustained the trial defense counsel's objection to the prosecutor's use of hypotheticals when the prosecutor asked the OCPD analyst if she had an opinion, based on her conclusion that Mr. Holtzclaw's DNA was absent, about whether it would be "more likely then if the secondary transfer was from Officer Holtzclaw's penis going into [C1's] 17-year-old vagina." (Tr. 4087)

A. The State's Forensic Analyst Incorrectly Used the Presence of DNA Matching Ms. C1's Profile to Argue that Vaginal Fluid was the Likely Source.

The State's forensic analyst made three errors while inappropriately using a DNA profile matching Ms. C1 to infer that vaginal fluid was likely to be present. (Tr. 4073)

First, the analyst's subjective claim that it was "a very good possibility" that, as the prosecutor phrased it, DNA matching Ms. C1's profile was "much more likely [...] to be

transferred if the epithelial cells are contained in a liquid such as vaginal fluid,” (Tr. 4073) was not founded objectively upon the evidence since no visible stains or deposits were observed, no body fluid tests were done, and the forensic analyst herself could not rule out the possibility of non-intimate DNA indirect transfer from the teenager’s purse via Mr. Holtzclaw’s hands to the fly of his uniform pants. (Tr. 4083); *see also* SAVINO & TURVEY at 526 (“In cases of sexual assault, the need for critical analysis mandated by objective science is especially important.”).

Second, the OCPD forensic analyst inappropriately used DNA profiles alone to compare the likelihood of DNA transfer via vaginal fluid, which she felt was “a very good possibility” (Tr. 4073), vs. indirect transfer of non-sexual skin cell DNA from the teenager, about which she replied, “I can’t disagree with that,” when asked by trial defense counsel if she agreed that non-intimate DNA indirect transfer (“secondary transfer”) could have occurred (Tr. 4083).

The forensic analyst’s preference for vaginal fluid transfer was incorrect because a DNA profile alone does not inform about “when, where, how or why” DNA transfer occurred. Gill at 13. Scientific articles establish “the possibility, but not the probability, of DNA transfer.” Meakin & Jamieson at 442; *see also* Ane Elida Fonnelop, Thore Egeland, & Peter Gill, *Secondary and Subsequent DNA Transfer During Criminal Investigation*, 17 FORENSIC SCIENCE INT’L: GENETICS 155, 155 (2015) (explaining that “research to evaluate the risks of passive transfer has not kept pace with” the development of increasing sensitivity of DNA analysis kits).

Third, the forensic analyst testified beyond the forensic science professional expertise when she said of the teenager, Ms. C1, that “a young woman of her age would be very likely to have quite a bit of lubrication” that could transfer cells. (Tr. 4065) The analyst then did not

explain the contradiction between her argument that vaginal fluid should be plentiful and her observation that nothing suspicious was visible on the fly of the uniform pants. (Tr. 4084)

B. The State Argued Incorrectly that the Exclusion of Mr. Holtzclaw as a Contributor to the DNA Mixtures Supported a Rape Scenario.

The prosecutor presented a flawed argument that vaginal fluid was likely to be present on the fly of the uniform pants, claiming that if Mr. Holtzclaw had transferred Ms. C1's non-intimate skin cell DNA via his hands to the fly of his pants, which "common sensically" he would have had to unzip and touch when urinating, then you would also expect to find Mr. Holtzclaw's DNA in those locations. (Tr. 4087-89) This flawed argument was premised on the OCPD forensic analyst's unscientific claims that items #17Q3 and #17Q4 from inside the fly of the uniform pants contained no Y chromosome and thus lacked evidence of male DNA (Tr. 4072), no DNA from Mr. Holtzclaw was found in any of the four samples, and an absence of his DNA was "very difficult to try and explain." (Tr. 4073, 4087-89); *see also* SAVINO & TURVEY at 365 ("DNA results can be incomplete or misleading, and therefore prone to misuse.")

1. The State's forensic analyst testified that she found no evidence of male DNA in samples #17Q3 and #17Q4, yet low levels of male DNA were detected.

As stated in Mr. Holtzclaw's brief (p. 44), contrary to the OCPD forensic analyst's testimony that she had found no evidence of male epithelial cell DNA in items #17Q3 and #17Q4 from the inside of the fly of the uniform pants (Tr. 4072), the DNA quantification results showed the presence of low levels of male DNA in both items, which had male DNA concentrations of 0.0102 and 0.0117 ng per microliter and a ratio of male to female DNA of 1:20 and 1:21, respectively. (DNA Quant Summary and OCPD qPCR Report for SD14-273, dated 10/1/2015)

The OCPD forensic analyst should have known there was male DNA in items #17Q3 and #17Q4 because she herself initialed the page on which the male DNA data appeared in plain view in a column labeled “Qty Male.” (OCPD qPCR Report for SD14-273, dated 10/1/2015)

2. We dispute the State’s forensic analyst testimony that Mr. Holtzclaw could be excluded from all four DNA samples from the fly of the uniform pants.

When the prosecutor asked, “So even though Officer Holtzclaw was wearing these pants, his DNA is not inside them; correct?” and the forensic analyst replied, “That is correct,” (Tr. 4072) her subjective statement showing 100% certainty that Mr. Holtzclaw was excluded as a contributor to the four DNA samples is an example of an error frequently made by expert witnesses, which is to overstate the probative value of the evidence and go “far beyond what the relevant science can justify.” PCAST Report at 29.

The exclusion of Mr. Holtzclaw as a contributor to the DNA samples from the fly of the uniform pants (Tr. 4072) was wrong for four reasons.

First, the OCPD forensic analyst never used Y-STR profiling to analyze the male (Y) chromosome DNA variations in items #17Q3 and #17Q4 to determine whether they could have derived from Mr. Holtzclaw. *See* TAUPIN & CWIKLIK at 136 (usefulness of Y-STR profiling). Therefore, excluding Mr. Holtzclaw as a contributor was an error.

Second, the allele data were inconclusive as to whether Mr. Holtzclaw could be excluded or not from the four DNA mixtures, which had numerous alleles below the stochastic threshold, meaning that one cannot assume their sister alleles from paired chromosomes were detected during testing. (O.R. 182, 187); *see also* JOHN M. BUTLER, ADVANCED TOPICS IN FORENSIC DNA TYPING: INTERPRETATION 93 (1st ed. 2015) (definition of stochastic threshold). Conclusively excluding Mr. Holtzclaw as a contributor to the four DNA samples was incorrect because, when

analyzing DNA mixtures from more than one individual where some alleles are below the stochastic threshold, one cannot know the complete DNA profile of every contributor due to the possibility of allele drop-out or drop-in caused by stochastic effects in PCR amplifications with low DNA quantities, the possibility of significant allele sharing among individuals, and the possibility of contamination by alleles from environmental background DNA. (O.R. 182, 187); *see also* BUTLER at 454 (explaining reasons for inconclusive results).

Calculating the weight of evidence towards exclusion of DNA from Mr. Holtzclaw or any of the complainants from the four DNA mixtures, for which allele drop-out was a possibility, can only be carried out by using a probabilistic statement such as a likelihood ratio (LR), which was not utilized by the OCPD forensic analyst. *See* BUTLER at 295 (explaining that “LRs involve a comparison of the probabilities of the evidence under two alternative propositions,” such as the DNA came “from the suspect” vs. “from an unknown person out in the population at large”).

For instance, items #17Q1 (from the outside of the fly) and #17Q2 (from an interior flap) were complex mixtures, defined as “mixtures with more than two contributors” that superimpose multiple individual DNA profiles for which alleles may be missing or may overlap with each other, such that examiners must ask what the probability is that an individual’s DNA profile could be present within the mixture profile, rather than use an inclusion/exclusion approach. *See* PCAST Report at 75-76.

In fact, item #17Q1 may have derived from at least 4 individuals due to the presence of 7 alleles at one locus. (O.R. 187); *see also* SCIENTIFIC WORKING GROUP ON DNA ANALYSIS METHODS, SWGDAM INTERPRETATION GUIDELINES FOR AUTOSOMAL STR TYPING BY FORENSIC DNA TESTING LABORATORIES 7 (2010) (explaining how to calculate the minimum number of

contributors). There is some debate in the forensic community about using likelihood ratios for 4 or more contributors. *See* PCAST Report at 8, 80-81 (explaining that “substantially more evidence is needed to establish foundational validity” for using likelihood ratios for mixtures with 4 or more contributors). However, some laboratories calculate likelihood ratios for such mixtures using specialist probabilistic software that can take account of stochastic effects and peak imbalance, yet the OCPD lab did not use or attempt to use appropriate software. *See id.*

The forensic analyst’s testimony excluding Mr. Holtzclaw as a potential contributor to the DNA mixtures was therefore an error because it was based on a subjective assessment rather than an objective one. *See* PCAST Report at 8 (“[S]ubjective analysis of complex DNA mixtures has not been established to be foundationally valid and is not a reliable methodology.”); *see also* Boies at 407, 414 (noting that DNA testing, analysis, and interpretation are affected by human error because forensic analysts interpret results subjectively).

Third, even on a subjective basis, Mr. Holtzclaw cannot be excluded as a contributor to items #17Q1 and #17Q2 because the majority of the alleles present in Mr. Holtzclaw’s DNA profile (including sex chromosomes) are present in both items. The number of alleles in common with Mr. Holtzclaw equals 27 out of 32 alleles in #17Q1 and 22 out of 32 alleles in #17Q2, albeit at a low level. (O.R. 187) Similarly, Mr. Holtzclaw’s DNA could be present in DNA items #17Q3 and #17Q4 at a low level as a minor contributor because these mixtures contain 19 and 21 alleles matching those of Mr. Holtzclaw, respectively, out of 32 alleles in total, with many of the matching alleles being present below the stochastic threshold while others could be shared with the major contributor matching Ms. C1’s DNA profile. (O.R. 255)

Fourth, the OCPD forensic analyst should not have excluded Mr. Holtzclaw as a potential contributor to items #17Q2, #17Q3, and #17Q4 during her testimony because this erroneous conclusion conflicted with her own OCPD forensic examination reports, in which she stated correctly that in item #17Q2 “the minor component is not suitable for comparison purposes due to insufficient data,” and in items #17Q3 and #17Q4 the minor contributors were “not suitable for comparison purposes, due to insufficient genetic material.” (O.R. 182, 253) Such statements mean that the results are inconclusive, being insufficient to clearly exclude, or not exclude, an individual’s DNA profile. *See* BUTLER at 454.

The OCPD forensic scientist’s testimony excluding Mr. Holtzclaw from being a potential contributor also contradicted the OCPD DNA Laboratory STR Interpretation Procedure Manual guidelines (Issue Date 11/17/13), which state that an “inconclusive” conclusion is to be arrived at when there is “insufficient data,” “mixtures of DNA from multiple donors,” or “stochastic effects resulting in allelic drop-out,” which were issues with the DNA samples.

3. The State’s forensic analyst displayed lack of awareness that touching an item may not deposit one’s own DNA.

When the OCPD forensic analyst claimed that an absence of Mr. Holtzclaw’s DNA was “very difficult to try and explain” (Tr. 4073), which was used to support the prosecution’s argument that Ms. C1’s DNA was unlikely to have transferred innocently via Mr. Holtzclaw’s fingers (Tr. 4087-89), the forensic analyst ignored scientific research, available before the trial, that proved people can transfer someone else’s DNA that is on their hands without transferring their own DNA to objects they touch. *See* Meakin & Jamieson at 437; *see also* Cale *et al.* at 196, 202. She also ignored research revealing that people do not always transfer their own DNA (“wearer DNA”) in detectable levels to their own clothing or to touched objects, and even

repeatedly touching an object does not necessarily deposit DNA. *See* Meakin & Jamieson at 442; *see also* Michelle Breathnach, Linda Williams, Louise McKenna & Elizabeth Moore, *Probability of Detection of DNA Deposited by Habitual Wearer and/or the Second Individual Who Touched the Garment*, 20 FORENSIC SCIENCE INT'L: GENETICS 53, 58 (2016) (demonstrating that wearer DNA was not detected in a significant number of samples from the waistband of men's underpants in a study published online on October 17, 2015); Mariya Goray & Roland A.H. van Oorschot, *The Complexities of DNA Transfer During a Social Setting*, 17 J. OF LEGAL MEDICINE 82, 90 (2015) (discovering that "in many instances even a simple primary contact did not result in detectable deposit of participant's own DNA," even with lengthy, repeated contact).

Studies of people's "shedder status" reveal that some individuals at various times do not readily deposit their own DNA, which could account for not finding all of Mr. Holtzclaw's alleles in the four samples from the fly of the uniform pants. *See* Meakin & Jamieson at 437-438; *see also* Ane Elida Fonnelop, Merete Ramse, Thore Egeland & Peter Gill, *The Implications of Shedder Status and Background DNA on Direct and Secondary Transfer in an Attack Scenario*, 29 FORENSIC SCIENCE INT'L: GENETICS 48, 59 (2017) (concluding that an individual's shedder status significantly influences the probability of DNA direct and secondary transfer, and a low shedder may not transfer detectable DNA).

C. The State's Forensic Analyst did not Testify Clearly about the Presence and Implications of DNA from At Least One Male.

If the non-semen DNA mixtures from several unknown individuals including at least one male in the four samples from the fly of the uniform pants had been reported and discussed thoroughly by the prosecution and trial defense attorney, then these results would be expected to

have undermined the prosecution's argument that sexual assault was the most likely explanation for the discovery of DNA matching Ms. C1's profile on the outside and inside of the fly of Mr. Holtzclaw's uniform pants. The implication of finding male DNA is that it demonstrates an individual's DNA can transfer to the fly of the uniform pants without any involvement of that individual's vaginal fluid, since males do not make vaginal fluid.

Furthermore, it is expected that male DNA in item #17Q1 came from at least one male who is not Mr. Holtzclaw based on the strength of the Y chromosome allele and the fact that Mr. Holtzclaw could not definitively be included in this mixture. Yet the method by which this male DNA transferred was not investigated even though it could be the same method by which DNA matching Ms. C1's profile transferred to the fly of the uniform pants.

During the trial, the prosecutor and the State's forensic analyst never overtly disclosed the presence of at least one male contributor in the DNA samples, nor did defense counsel observe there was male DNA in the samples. (Tr. 4044, 4056, 4073) As previously explained, the State's forensic analyst claimed incorrectly that there was no evidence of male DNA in items #17Q3 and #17Q4. (Tr. 4072) She also never testified overtly that male DNA was found in item #17Q1 in close to equal proportions with the female DNA (Tr. 4042), indicating approximately a ratio of about half male DNA to half female DNA in this sample. The forensic analyst also dismissed the importance of the Y chromosome in item #17Q2, simply testifying that "the X is in black and the minor contributor is a Y, but it's in red so it really basically doesn't count," and "the statement that best suits that minor contributor is that it is not suitable for comparison purposes." (Tr. 4044, 4056)