DNA TYPING AND

OTHER FORENSIC EVIDENCE ISSUES

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Forensic Evidence and DNA Typing – Legal and Practical Issues

I. Admissibility Under MRE 702

A. Old rule required that scientific, technical or other specialized knowledge be "recognized"

1. Determining if a scientific technique or theory is "recognized" required application of *Frye* rule of general acceptance by disinterested and impartial experts. See *People v. Barbara, 400 Mich. 352, 376, 255 N.W.2d 171 (1977).*

2. Rule criticized as being too conservative; excluded relevant evidence

B. New rule replaces "recognized" with three requirements:

1. Testimony must be based on sufficient facts or data

2. Testimony must be the product of reliable principles or methods

3. Witness must apply principles and methods reliably to the facts of the case

C. Amended language clearly intended to replace Frye with Daubert as it adopts the new FRE 702 which was amended post--Daubert

1. Second requirement of reliability in line with *Daubert's* scientific validity inquiry

2. Third requirement permits exclusion of evidence even if based on scientifically valid theory or technique

a) Evidence not admissible if the proponent's expert did not reliably apply the theory or technique

b) Not merely a weight issue if expert did it incorrectly

        c) Useful in arguing for appointment of expert: you have to know if it was done correctly in order to file pretrial challenge

II. Amended Rule 703

A. Requires that all facts or data relied on by testifying expert be admitted into evidence

B. Useful in discovery

    1. Often proponent of scientific evidence does not want to provide opponent with all facts and data. E.g., DNA cases

    2. Since it all has to be admitted in evidence, no reason to withhold from opponent

C. We should welcome the trend toward full disclosure of all data

III. Particular Issues in Criminal Cases

A. Forensic Evidence

    1. DNA

    2. Fingerprints

    3. Bitemarks, hair analysis

    4. Polygraphs

B. Non-forensic Expertise

    1. Behavioral and social sciences

        a) Psychiatric and syndromes

        b) Eyewitness ID

        c) Hypnosis

    2. Statistical analyses

C. General assumptions

1. **What is forensic science?**

    a) **Science exercised on behalf of the law to help resolve legal conflicts**

    b) **In the criminal context: scientific techniques utilized to convict the guilty and exonerate the innocent**

2. **Inherent conflict: truth vs. justice**

    a) **The true scientist cares only about scientific truth; lawyers care only about what helps or hurt their case.**

    b) **Unfortunate result: some forensic analysts abandon the neutrality required of scientists and becomes advocates for their employer/client**

3. **Purposes of forensic analysis**

    a) **Comparison**

        (1) *Typically comparing something found at the crime scene with something associated with the suspect*

        (2) *Class vs. individual characteristics: Can lead to an inference of identification but not always*

    b) **Identification and individualization**

        (1) *Identification: placing an item in a category*

        (2) *Individualization: establishing uniqueness can usually only be achieved through probabilities*

    c) **Evaluation of Source**

        (1) *Concerned with where did it come from*

        (2) *Production considerations, segment relationship, alteration relationship, spatial location*

(3) Same as that vs. born of that

4.   The Scientific Method

a) Define: formulation and testing of hypothesis, publication in peer-reviewed journal, duplication of result by other scientists

b) Terms: reliability, validity, accuracy, and precision

c) Problem: forensic sciences deal often with unique events. The general scientific community is not interested in the forensic applications so no independent research is done. Forensic scientists often end up modifying accepted techniques or inventing new techniques without subjection their work to the rigor of the scientific method.

d) Remedy: Forensic analysts substitute intuition, experience, or *ipse dixit*. Unacceptable.

D. The Admissibility of Scientific or Expert Testimony Under Daubert v. Merrill Dow, 509 U.S. 579 (1993) and Kumho Tire v Carmichael, 526 U.S. 137 (1999)

1. Scientific testimony/evidence is admissible if

a) Relevant

(1) can assist trier of fact

(2) tends to establish a proposition that is in issue

b) Reliable

(1) grounded in the methods and procedures of science

(2) inferences or assertion advanced by proponent must derive from the scientific method

2. Trial judge is the gatekeeper

    a) not sufficient to simply rely on the consensus of scientific community

        (1) trial judge must find that scientific method is scientifically valid and

        (2) can properly be applied to the facts

    b) Inquiry flexible: No "definitive checklist or test" for determining the reliability of expert scientific testimony

    c) Court lists several pertinent factors:

        (1) whether the theories and techniques employed by the scientific expert have been tested;

        (2) whether they have been subjected to peer review and publication;

        (3) whether the techniques employed by the expert have a known error rate;

        (4) whether they are subject to standards governing their application;

        (5) whether the theories and techniques employed by the expert enjoy widespread acceptance.

3. Inquiry flexible but must focus on the expert's principles and methodology and not on the conclusions they generate

  a) Evidence must be grounded in the methods and procedures of science

  b) Also must be grounded on reliable information and theory

4. *Daubert's* **general holding extended to non-science, experienced-based expertise in** *Kumho Tire*

  a) Narrow rather than global reliability: Court must first determine reliability of the proffered expertise as it was utilized in the specific litigation

  b) Flexibility: Court must select appropriate criteria of reliability

  c) Ultimate determination: Is there good reason to believe that the expert testimony provides the fact-finder appropriately reliable information on the case-specific question?

5. Places tremendous discretion in trial judges

  a) Purpose is to open up courtroom for more scientific or expert evidence

  b) Court expects vigorous cross-exam, contrary evidence and careful instructions provide appropriate safeguards

E. Problem Area: Forensic Identification Science

1. Defined as testimony which aims to connect crime scene object or mark to the one and only source

    a) Not based on normal applications of basic science like toxicology or serology

    b) Typically invented by police investigators to solve crime

    c) Examples: handwriting identification, fingerprints, firearms, toolmarks, bitemarks, hair and fiber ID, tiremarks, footprints – see other notes

2. Problem: how to establish reliability of the claims of these forensic examiners

    a) Traditional solution: *Ipse Dixit* (or close relative "experience")

    b) Post-Daubert solutions:

        (1) Some courts have found this testimony was not based on science therefore no admissibility hurdle other than relevance

        (2) Or, courts have erroneously limited Daubert to <u>novel</u> scientific evidence

        (3) Or, courts have substituted experience for empirical knowledge

3. In the wake of *Kumho Tire*, it is clear that forensic ID testimony is subject to *Daubert*

4. Significant cases

a) *United States v Hines*, 55 F Supp 2d 62 (D Mass 1999): Dist Ct applied *Daubert/ Kumho* to handwriting identification and found it inadmissible because there are no meaningful validation studies in the field.

b) *United States v Mitchell*, no. 96-407-1 (ED Pa Feb 2000): Unpublished fingerprint case. Defendant's challenge to reliability of latent print identification rejected based on trial court's bald conclusion that evidence was admissible and probative value outweighed prejudicial impact.

c) *United States v Llera-Plaza, 188 F Supp 2d 549 (E.D. Pa. 2002):* Federal judge initially found that ability of latent print examiner to conclude that fingerprint originated from particular individual was not scientifically demonstrated. Court then reversed itself and upheld admission of fingerprint testimony.

5. Recommendations

a) 702 applies to scientific and non-scientific expert testimony.

b) Not limited to "novel" theories or techniques as *Frye* was.

c) While *Daubert's* pertinent factors are not necessarily required, they provide a solid reference point; judge still has to determine that expert's testimony is reliable both in theory and in practice. *Ipse dixit* is unacceptable whether it comes from the experts or the judge

IV. Forensic DNA Typing

A. *DNA is essentially the same in all humans -*

   1. **Contains information necessary to produce proteins;**

   2. **Important that everyone produces the necessary functional proteins**

   3. **Virtually all fluids and tissue in the body contain DNA**

   4. **DNA is stable and does not change over time**

B. *Certain regions of the DNA are highly variable/differ from person to person (except identical twins)*

   1. **Only these regions ("Junk DNA") are suitable for typing;**

   2. **If typing shows differences in DNA from these regions, the DNA cannot have come from the same person**

C. *Different methods used in forensic DNA typing have common procedures*

   1. **Isolation of DNA from evidence sample - unknown origin**

   2. **Isolation of DNA from sample from known individual**

   3. **Processing of DNA so that results can be obtained**

   4. **Determination of test results or DNA types from specific regions of DNA**

   5. **Comparison and interpretation of results from unknown and known samples to determine whether known individual is excluded (not the source of the evidence DNA) or included (could be the source)**

D. *Typically these tests are repeated on other sites or loci of the DNA molecule*

   1. **If sufficient number of tests performed and the samples still match, i.e., the DNA from the known individual is consistent in every regard with the evidence DNA, can reach a point where**

the remaining population of the world is excluded as a potential source.

2. Only conclusion is that the known individual is the source of the evidence DNA.

E. Types of DNA Analyses

1. **RFLP - Restriction Fragment Length Polymorphism**

   a) **Compares variations in length of a defined portion of DNA (VNTRs)**

   b) **Originally the most discriminating DNA test**

   c) **Requires more and better quality DNA sample**

   d) **Involves complex statistical methods for interpretation of results**

   e) **Results are displayed on autoradiographs**

2. **PCR - Polymerase Chain Reaction**

   a) **Process of copying or amplifying DNA**

   b) **Able to detect DNA in very small samples**

   c) **Analysis much easier than RFLP (and doesn't involve radioactive chemicals)**

   d) **Each system has less variability than RFLP systems but now many systems can be tested to achieve high levels of discrimination - STR's**

   > *(1) main difference between VNTR and STRs is their size and ease of use with PCR. STRs have smaller repeat units (usually 3 to 5 pairs) and fewer of them (usually 7 to 15 alleles per locus). The smaller size of the STRs allow for smaller quantities of DNA needed for analysis. (also allows for more preservation of forensic evidence which in turn can be used for verification/ validation analysis by additional laboratories).*

(2) Although VNTRs include more alleles per locus, STR loci are much more numerous, providing the same discriminating power by using more loci. In addition, multiple STR loci can be analyzed simultaneously (multiplexed).

e) Results displayed on "dot-blots" or gels using allelic ladders; computer printouts showing "peaks"

f) With 13 STR loci the general match probability is about one in 6 x10^14. (the numbers vary with sub populations, for example the probability of a match between profiles of two unrelated persons in a randomly mating population of Caucasian Americans is 1.74 x 10^-15 or one in 575 trillion)

(1) 13 STR loci were selected for use in the Combined DNA index System (CODIS;5): CSF1PO, FGA, TH0!, TPOX, vWA, D3S1358, D5S818, D7S820, D8S820, D8S1179, D13S317, D16S539, D18S51, and D21S11.

(2) Used by FBI and most state crime labs (including MI); uniformity permits use of national database (CODIS)

3. **Y-STR**

   a) **Types only the paternally inherited Y chromosome and only in males**

   b) **Can type up to 11 different markers in the Y chromosome: DYS19, DYS385a/b, DYS389I, DYS389II, DYS390, DYS391, DYS392, DYS393, DYS438 and DYS439**

   c) **Used in paternity cases and in criminal cases: Sexual Assaults with Single & Multiple Assailants**
   -- Fingernail Scrapings from Female Victim/Male Assailant
   -- Male/Female Bloodstain & Saliva Mixtures
   -- Azoospermic males

4. **MtDNA - Mitochondrial DNA**

   a) **DNA from Mitochondria, not nucleus**

   b) **Inherited maternally (no good for paternity testing)**

   c) **Sequences DNA in certain variable portions of mtDNA**

   d) **Used with extremely degraded DNA samples or hair, bone, teeth**

F. Statistical Component

   1. **In any type of test, if DNA from evidence sample does not match DNA from a person, that person is absolutely excluded as a potential source of the evidence DNA.**

   2. **If a match is obtained, does not conclusively identify DNA obtained from an evidentiary sample as belonging to one specific individual.**

   a) **Forensic DNA typing looks at only a very small portion of the human DNA.**

b) Scientists must calculate the probability that the fragments of DNA found in the evidence sample would match a person randomly selected from the same population as the suspect or the victim.

G. Statistical Methods - the Product Rule

1. Analyst types different areas of the DNA molecule, obtaining a number of independent results or banding patterns - as many as 13 today

2. Results are matched with results obtained from identical tests run on a known individual's DNA.

3. Using population frequency data, the analyst then determines the frequency that each pattern occurs in the specific population at issue.

4. Finally, the analyst multiplies the frequencies of each banding pattern to reach a final probability of a random match.

a) Multiplication of individual frequencies, the "product rule", will often result in an extremely low probability of a random match such as one in one billion.

b) Based on Hardy-Weinberg theory

5. Caution: Misuse of Statistical Evidence

a) Even if probability of a random match is 1/1,000,000, it does not mean that there is a 1/1,000,000 chance the D is innocent or a 999,999/1,000,000 probability of guilt

b) Expert must not go beyond random match numbers

H. Defense Experts

1. Difficulty in obtaining funds from trial court.

a) Expensive: Trial courts not willing to throw money away for needless experts.

b) Legal hurdles: *People v Tanner*, **469 Mich. 437 (2003): It is not enough for defense to show a possibility of assistance for a requested expert. "Without an indication that the testimony would benefit the defense…" a trial court does not abuse its discretion in denying a defense motion for appointment of an expert witness. The defense must show that he cannot safely proceed to trial without such expert assistance.**

c) Catch 22: Defense often cannot show how expert testimony can help the defense without an opinion from expert. D must retain expert to find out whether and how expert can assist.

d) Solution: 2-step approach. Courts should agree to permit D a minimal amount for consultation. Then if after consultation, defense can show appropriate nexus between expert's opinion and ability to safely proceed to trial. Court should authorize more funds.

2. **Attacks on defense experts**

  a)   In recent DNA cases, prosecutor has attempted to use 702 and *Daubert* **to prohibit the defense expert from testifying.**

  b) Specifics of attack

> *(1)Defense expert is not forensic scientist / does not work in crime lab*

> *(2)Judges in other jurisdictions have questioned impartiality of a particular expert's opinion*

  c) Neither of these attacks has any merit under 702

> *(1)new MRE 702 does not change the standards for qualification of an expert. The new MRE 702 changes the standards for the introduction of scientific or expert testimony. These are two different concepts.*

(2) Under both former and current MRE 702, "…a witness [can be] qualified as an expert by knowledge, skill, experience, training, or education...."

(3) Impartiality is no longer a requirement for admissibility of an expert. That was an issue under the old Frye rule and it only applied to the proponent of a novel technique or theory.