BOOK REVIEW

Robert E. Wenk,[1] *M.D., M.S.*

Review of Inman et al. "An Introduction to Forensic DNA Analysis"

REFERENCE: Inman, K. and Rudin, N. An introduction to forensic DNA analysis. CRC Press, Boca Raton, FL; 1997, 256 pp.

The two qualified authors of this attractive, spiral-bound handbook have attempted to expand a previous publication and, simultaneously, to translate "science into English" (p.1). Novices are presented with a number of instructive presentations in both narrative and illustrative formats. Some chapters (e.g., Chapter 7) are succinct, accurate and especially helpful to a beginner. Some appendices and references provide the reader with ready information and means of learning more about specific subjects. The index appears complete and accurate. The illustrations and the paper on which they are printed are of high quality. Unfortunately, the authors have only partly succeeded in meeting their two objectives. I hope the next version of the work will address the issues cited below.

The textbook is well organized into thirteen chapters, a glossary, fifteen appendices, and an index. Chapters include the: Introduction, Nature of Physical Evidence, Collection and Preservation of Physical Evidence, History of DNA Typing, Scientific Basis of DNA Typing, Overview of Forensic DNA Typing Systems, Procedures for Forensic DNA Analysis, Significance of Results, Interpretation of DNA Results, Quality Control/Regulation, Admissibility Standards, and Epilogue which deals with future change.

The text contains errors of omission and commission, faulty conclusions, and an excessive number of words. The volume of material could easily be reduced by 20%. An incorrect, inaccurate or nondescript term is often selected by the writers, producing the unfortunate effect of undermining the reader's confidence in the author's scientific expertise and authority. For example, the term "number" substitutes for "proportion" (p. 8.); DNA of interest is "amplified" (it is not "purified") with effective selection of background DNA (p. 47). "Orifices" is used when "secretions" is meant. A person may be "homozygous for a particular *allele*" (not for a particular *locus*) or homozygous "*at* (not "for") a particular locus" (p. 68). Terms are occasionally used without definition in the glossary (e.g., "flanking sequence" on p. 48). Although the HLA-DQA1 system is repeatedly discussed, the symbols remain obscure to the reader, except for the inadequate definition of HLA given in the glossary as a "name for a locus". The author uses "lengths" (p. 79) when "gel position" would be better. Many other examples could be cited, but the point is that good instruction can and should include both proper scientific and English terminology.

Inadequate explanations seem to occur frequently, especially in early chapters. Discussion of conceptual ideas are sometimes too limited, unclear or illogical to comprehend. For example, bloodstains can be classified according to ABO group (as well as DNA pattern). The comment that "physical traits . . . are genetic in nature . . ." (p. 7) is both extraneous and misleading: ABO group classification and exclusion of a proportion of the population are independent of the idea that the bloodgroups are inherited. Another misleading statement (p. 43) indicates that presence of identical HLA types in semen recovered from two victims of separate attacks is evidence "linking the two sexual assaults". Different men can surely produce semen of one particular HLA type—it is simply the infrequency of an antigen or HLA haplotype that *suggests* that the assaults might be associated. On page 8, there is an implicit assumption that a donor of a stain is caucasian, when the author obviously means to use the caucasian group only to exemplify phenotype proportions. The text contains omissions as well as misstatements: "ABO blood types are an [sic] example of different alleles of the same gene . . ." (p. 31). What is meant is "three different alleles, (A,B and O) produce the four common blood phenotypes (A, B, O and AB) that arise from six common genotypes A/A, A/O; B/B, B/O, O/O and A/B". DNA deletion is omitted as a reason for single-band patterns of RFLP tests and mutation rates of RFLPs are not discussed (p. 112). Regarding Hardy-Weinberg equilibrium, I didn't understand the comment that it: ". . . means that the alleles at one locus show no *a priori* correlation with each other . . ." (p. 32). There is a casual and generalized dismissal of the effects of population substructure on the estimation of DNA profile frequencies. Surely, some population isolates can be problematical, but they are not considered at all. The adjectives used in "random assortment" and "independent segregation" seem reversed: the two alleles at a locus on homologs segregate randomly into daughter cells, whereas unlinked loci assort independently of one another.

The text is very uneven in its content and style, perhaps because the two authors have contributed particular sections or chapters without collaborating. Chapters vary greatly in length, clarity and instructive quality. Chapter 7 (Procedures) is 27 pages; other chapters are only a few pages long, but some would seem to require more information. For example, there is almost absence of any mathematical discussions in the text where some are surely needed. The authors omit discussion of misconduct as a way that sample switching can occur (p. 13). There is an annoying redundancy of

[1]Director, Baltimore Rh Typing Laboratory; Professor of Pathology, Pennsylvania State University; Associate Professor of Human Genetics, University of Maryland. 400 West Franklin Street, Baltimore, MD 21201.

words, thoughts and information, especially in the first several chapters. Such repetition might be a useful teaching method in a lecture series or when there is serial progression from simplicity to complexity, but rereading the same idea is simply boring. Page 63 is repetitious of page 14 as well as of appendices B and C. At times, the text begs for detail that is not forthcoming. Page 63 contains material about methods of DNA extraction, but a description of either organic or differential extraction is absent. Instead of a narrative discussion with side by side illustrations of test gels that might elucidate their functions, similarities and differences, the reader must use the text and several appendices to gain any comprehension.

Whereas some topics are explained inadequately, others might have been more easily illustrated than described. The term "allele," appears (p. 12) without prior definition and the reader must find its definition in the glossary where its definition would not be understood by a nonscientist. A cartoon diagram might have presented a better way to convey its meaning. The figures that do appear should have been better edited. The photograph on page 55, purporting to show the increased sensitivity of PCR over RFLP technology, conveys no meaning at all. Lanes 4 and 5 are mislabeled in Figure 9-7. Lanes of interest are unlabeled in the figure in sidebar 11 (p. 153).

There are lists of pertinent references at the end of each chapter. Unfortunately, the text does not refer to specific publications and the reader is left to guess which reference to find to obtain greater understanding. For example, I was unable to find a reference that would elucidate preferential PCR amplification. Similarly, I was unable to find a reference for DNA analysis of hair samples. Finally, many of the references are highly technical and would not be understood by much of the intended readership.

Much of the material in the appendices could have been included in the text so as to avoid the student's flipping back and forth to gain understanding. There are too many appendices that add little to understanding. Similarly, the sidebars seem to offer overly wordy case observations that are not very illuminating. Choice of words is poor. Sidebar 5 uses "both the same" when "identical" would do and "instigated" rather than "initiated." Standardization should occur "among" laboratories (not "between"). Some sentences are long and awkward, and there are typos (e.g., p. 77 "systen" [sic]). Critical editing by the publisher would have been helpful.

One of the weakest sections is the twelve page Glossary. There are many terms so poorly defined, described or explained, that they offer the reader no help in deciphering the text. "Amelogenin" is a protein (not a locus). The word "association" may have several specific meanings in forensic science, but they are not described. A "coding" [sequence] includes control elements, not simply structural ones. In describing chromosome segregation, it is possible (by uniparental disomy) to inherit both chromosomes from the same parent. Horseradish peroxidase does not produce a blue color. "Eukaryote" refers to organisms, not cells. "Binning," "chromosome," "genotype" and "heterozygote" are inadequately described, as is mitochondrial DNA inheritance. Who needs to know what FBI means? K562 is a cell line, not a standard sample. Monoclonal is not a "group" of anything, but an adjective. "Serology" is described without using the terms "antibodies" and "antigens." "Sperm fraction" omits how separation is achieved. Etc., etc., etc.

The first appendix, Key Phrases, is afflicted with problems similar to those in the Glossary. Discussion of sibling DNA, cutting enzymes, locus address and population sampling are inadequately described. There is no mention of mosaicism or chimerism (whereby cells of the same individual *can* have different types). Analysts are "competency tested", rather than "proficiency tested." I see no reason to include the Key Phrase appendix at all. Appendices B to E are simply figures that should be incorporated into a chapter. The content of other appendices, that deal with NRC reports, legal decisions, an example of frequency calculation, court decisions and briefs may be valuable for some readers.

In my opinion, confusing or misleading a student who is new to forensic science can be most discouraging and detrimental to the desired understanding between scientists and other professionals. Hopefully, a future edition will improve on the current text which has laudable objectives and acceptable structure. A progressive, but more accurate presentation is necessary. The authors need to develop a building block approach, to define their terms carefully, and to better describe the concepts that they mean to convey. The authors should be encouraged to try again.