DNA FINGERPRINTING

Background Information

In the last 15 years, DNA has played an increasingly important role in our legal system. Tissue evidence is now routinely collected during criminal investigations in hopes that it will provide genetic clues linking suspected criminals to crimes.

DNA profiles help forensic investigators determine whether two tissue samples -- one from the crime scene and one from a suspect -- came from the same individual. Fortunately, the genetic comparison doesn't require that investigators look at all of the DNA found in the tissue samples. That would take months or even years. Instead, by marking a small number of segments of DNA in one sample and then checking for the presence or absence of those segments in the other sample, investigators can say with some assurance whether the samples are from the same person.

How do they do it? Investigators use chemicals to cut the long strands of DNA into much smaller segments. Each segment has a specific length, but all of them share the same repeating sequence of bases (or nucleotides). The chemicals cut the segments at the beginning and at the end of the repeating string of nucleotides, so one segment might be ATCATCATCATCATC, for example, while another might be ATCATC. (The DNA segments used in forensic investigations are, of course, much longer than this.)

Investigators use a process called gel electrophoresis to separate these repeating segments according to length. Next, they introduce a small set of radioactive "markers" to the sample. These markers are segments of DNA of known length, with bases that complement the code of, and bind to, sample segments of the same length. The sample segment above (ATCATCATCATCATC), for example, would be tagged by a marker with the complementary code TAGTAGTAGTAGTAG.

Markers that do not bind to sample segments are then rinsed away, leaving in place only those markers that bound to complementary sample segments. Photographic film, which darkens when exposed to the radioactive markers, identifies the location of all marked sample segments. This film, then, becomes the DNA "fingerprint" that forensic investigators analyze.

The final step is a relatively simple matter of lining up the sample profiles side by side and comparing them for the presence or absence of segments with particular lengths. The more segments the two samples have in common, the more likely it is that the samples came from the same person.