SAMPLE AND BUFFER EFFECTS IN THE ANALYSIS OF DNA BY CAPILLARY ELECTROPHORESIS

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Capillary lifetime is an important issue in the successful automation of DNA typing. This is particularly true for systems that run unattended or contain multiple numbers of capillaries. This paper will present a preliminary study of the mechanisms involved in resolution loss in DNA analysis by capillary electrophoresis and discuss the formation of sample artifacts.

There are a number of different failure modes for capillaries. These include clogging, loss of resolution, and the onset of osmotic flow. Clogging tends to occur as a result of particulates in the sample or due to poor maintenance. Resolution loss may be the result of adsorption onto the capillary walls. Adsorption is a particular problem in DNA analysis as the capillaries utilize static or dynamic coatings to eliminate osmotic flow, and they are vulnerable to any material or mechanism that can interrupt the continuity of the coating. These effects may result in the onset of osmotic flow in the capillary, making retention times irreproducible.

Other mechanisms for premature capillary failure may actually be sample related. Particulates in the buffer and voltage spikes can induce noise on the electropherogram. Impure formamide can produce weak signals and may result in the renaturation of the sample. DNA structural effects can produce migration shifts with large variations in temperature. This paper will discuss these effects using fluorescent STR multiplexes and a variety of different capillary and buffer systems. Results will be discussed along with possible solutions to extend capillary life.