THE DEVELOPMENT OF RAPID PORTABLE YSTR ANALYSIS SYSTEM

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We have developed a rapid portable YSTR analysis system, which can analysis YSTR from mixed sample swab about one hour automatically. About a decade, we have enthusiastically been studying and developing a portable rapid DNA analyzer, which can perform DNA analysis on-site aiming safe, secure, and reliable society. We already developed a rapid portable DNA analysis designed to analyze nine loci, such as D16S539, D18S51, D3S1358, D5S818, D8S1179, FGA, TH01, vWA and Amelogenin. This system is very reliable, since it has eight independently controlled PCR chambers and those are directly connected to eight electrophoresis channels. Due to this mechanism, we can almost always obtain result, even some PCR and/or electrophoresis failure occurred. For this development those loci are converted to YSTR loci. This is the world first "rapid portable YSTR analysis system", as our knowledge.

There are several key technologies;
1. Multilayer printed channels and valves sheet (mPCVS) technology
A chip consists of several layers of artworked silicon-elastomer films on which patterns of adhesive and non-adhesive area is artworked. Liquid and control air can get through between the films. Comparing to commonly used channeled type chip, our method is easier and less expensive.

2. High speed micro PCR
The chip equipped eight PCR chambers. Under those eight PCR chambers, small Peltier devices are placed and utilized for high speed thermal cycling process. Seven PCR chamber contains one or two sets of primers. The thermal ramp speed is more than 10[C/sec], which is much faster than that of the commercial PCR device (around 3[C/sec]).

4. Electrophoresis
Amplicons of eight PCR chambers are injected into eight electrophoresis channels utilizing the novel proprietary injection technology. We have developed small and robust spectrometer, which can separate fluorescence emitted by both amplicon and size standards. The length of electrophoresis channels is about four centimeter, and it takes about three minutes for electrophoresis. We have developed STR analysis program, based on super resolution technique.