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# The evaluation of the IDENTIFILER system in paternity testing in Poland

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**Abstract.** The analysis of the IDENTIFILER system usefulness in paternity determination in the population of central Poland was carried out. An empirical and a theoretical approach have been taken into consideration, aimed at evaluating the exclusion efficiency of 15 STR markers as well as establishing the value of the paternity index. The combined values of PE and PI exceed 0.999999 and $8.4 \times 10^9$, respectively. © 2003 Elsevier B.V. All rights reserved.

*Keywords:* Multiplex STR; Paternity testing; Poland

## 1. Introduction

The IDENTIFILER system is one of the two currently available multiplexes containing a panel of 15 STR loci in paternity determination [1]. This paper assesses the validity of STR loci included in the IDENTIFILER system for the use in paternity testing in Poland. An empirical and a theoretical approach were taken into consideration in order to validate 15 loci and the whole system for the resolution of paternity cases.

## 2. Materials and methods

Samples used in the validation for paternity testing were obtained from routinely performed cases at the Department of Forensic Medicine, Medical University of Lodz, Poland. In each case, the blood samples were taken from the mother, one child and one alleged father. DNA extraction was carried out using a salt method described by Lahiri and Nurnberger [2]. Analysed data contained 51 inclusion cases and 117 exclusion cases constructed by linking several mother/child pairs with random, unrelated men.

Amplification of 15 STRs was performed using the IDENTIFILER system with a detection on ABI Prism 377 sequencer (Applied Biosystem). Statistical evaluation was made using the following statistical parameters: power of exclusion (PE) [3] and paternity index value (PI) [4].

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## 3. Results and discussion

### 3.1. Exclusion paternity cases

The power of exclusion (PE) is the parameter evaluating the loci/system efficiency of exclusion in parentage testing. Fig. 1 presents the observed and expected value of the power of exclusion for each marker in a sample population of Poland. A high value of exclusion efficiency was noticed for D2S1338 locus (75.17% expected PE and 77.78% observed one) and than for D18S51, FGA and D21S11 loci. Locus TPOX in theory (PE = 36.09%) and in practice (PE = 20,51%) was the poorest in exclusion efficiency. The average observed PE for locus—57.60% is very similar to the expected one—59.21%.

If a panel of 15 systems is applied in combination, the value of PE (theoretical and practical) reaches 99.9999%, meaning that, on average, only 1 out of million of non-fathers would remain unexcluded. The most frequently we observed nine exclusions (in 23.08% of all exclusion cases). We did not find any exclusion trio cases with only one, two or even three exclusions, which seems to be enough protection before the mutation event. For example, the investigation of 14 STRs gives one excluding result in 0.01% and exclusion in two loci in 0.14% [5].

### 3.2. Inclusion paternity cases

An evaluation of paternity testing (PI) index in 51 inclusion cases is contained in Fig. 2.

The highest observed and expected PI values were noticed for FGA system (7.3 vs. 8.4) and then for D18S51,D21S11 and D2S1338. Clearly, the lowest observed and expected PI value was obtained for TPOX locus (2.8 vs. 2.1).

The combined value of the expected average paternity index—$8.4 \times 10^9$ is very near to the one observed in the analysis of 51 inclusions cases—$9.2 \times 10^9$. The minimum PI combined value received in the analysis of 51 inclusion paternity trio cases was $3.4 \times 10^5$ . The maximum value of PI received in analysed cases was

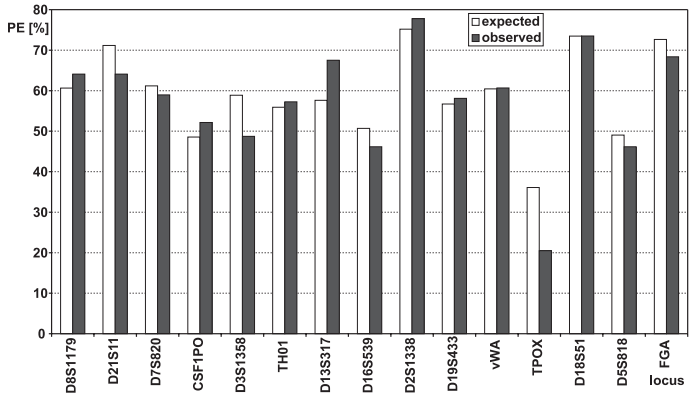


Fig. 1. Power of exclusion (PE) for STR IDENTIFILER loci examined in 117 exclusion cases. □—expected value; ■—observed value.

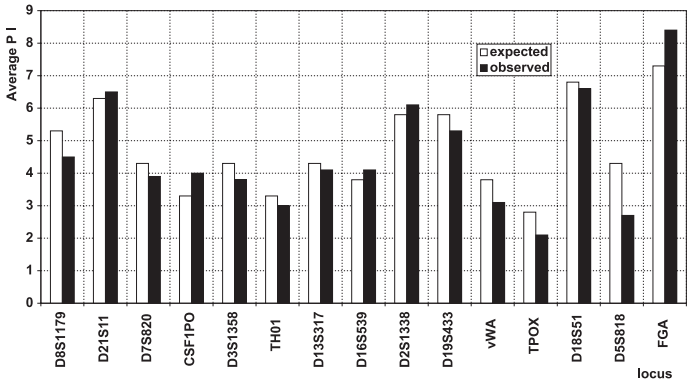


Fig. 2. Average paternity index (PI) for STR IDENTIFILER loci examined in 51 inclusion cases. □—expected value; ■—observed value.

$4.4 \times 10^{11}$. In majority of the investigated trio cases (60.39%) after the examination of 15 STRs markers, the value of PI varies between million and milliard. When 12 STRs markers are investigated, analogous values vary between 10 thousands and 10 millions [6].

## 4. Conclusion

The analysis performed on Polish population proved that the panel of 15 STR loci included in IDENTIFILER system was sufficient to satisfactorily resolve all investigated trio paternity cases. The received number of excluding loci, not less than 4, is suitable, in our opinion, to protect from the mutation event when a judgment of non-paternity is formed. The obtained in inclusion cases value of the paternity index, greater than 100,000, according to our laboratory standards is sufficient to ascertain fatherhood status.

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