EXPERIMENTAL STUDY ON DETECTABILITY OF SOME CHOSEN ENZYMES IN BLOOD STAINS

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The examination of human bloodstains belongs to one of the most important aims of the forensic medicine. The application of polymorphic red cell enzymes in examination of bloodstains has allowed to extend the possibilities of their identification. In this paper, the authors have presented the results of the research on application of chosen red cell enzymes in the identification of human bloodstains.

Material and methods

There have been investigated 584 human blood stains taken from subjects of known phenotypes PGM, AK, AcP, EsD, prepared on various grounds such as glass, linen, wood, rusted iron, refined iron, plastic and paper. The stains were stored at the temperature of 4^{o}, 22^{o}, 45^{o}C and examined periodically by means of electrophoresis on Sartorius cellulose acetate foil, on Cellogel and with the usage of Beckman Microzone Cell /1, 2, 3/. The isoenzymes were dyed in a typical way /1/.

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Results

The average time of detectability of the examined enzymes in the blood stains stored in various conditions is presented in the table I.
A progressive vanishing of the activity of the particular isoenzymes and appearance of quantative changes were observed in the course of investigations. In the case of phosphoglucomutase /PGM/ the appearance of additional weak zone, located above fraction d, which didin't cause the problems with interpretation of the electrophoretic picture, could be observed. Remarkably disadvantageous influence of increased temperature was observed in the case of determining phenotype AcP. It influenced not only the time of detectability of the enzyme but also the appearance of some additional fractions of various, dependened on a phenotype, localization. The reconstruction of the AcP picture obtained after the usage of 0.05 M of Mercaptoethanol, in most cases allowed to determine the phenotype AcP to the time given in the table I, according to the temperature of storage and the background of the blood stain. The least questionable was determining the phenotypes of AK. Only in bloodstains kept on the moisty background the increase of activity of normally weak zones and appearance of additional fractions located on the anoda side was observed.

In the group of examined enzymes the shortest time of detectability and the least precise results were obtained in the investigation of EsD. In the stains stored in the room temperature only after several days the activity of the enzyme decreased considerably and the first negative results appeared.

According to conducted experiments it is possible to state that application of the method of investigation on cellulose acetate foil allowes to determine the phenotypes of the adenylate kinase, phosphoglucomutase and acid phosphatase for a relatively long time ; this in turn allows to use those enzymes for identification of blood stains in practice ; moreover, a small quantity of blood is needed for such an experiment. However a little stability of the esterase D and relatively short time of detectability of this enzyme while applying the method in this experiment limits considerably the usefulness of this enzyme for the forensic medicine.

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Table I

MEAN TIME OF DETECTABILITY OF ENZYMES IN BLOOD STAINS

t i m e i n m o n t h s

Temperature	Kind of ground	ENZYMES			
		PGM_1	AK	AcP	EsD
4°C	glass	17	70	15	0.7
	linen	16	70	13	0.2
	wood	18	70	13	0.6
20°C	glass	9	70	8	0.023
	linen	7	40	3	0.03
	wood	10	50	7	0.1
	plastic	5	40	4	0.03
	refined iron	5	40	6	0.02
	rusty iron	6	40	6	0.03
	paper	6	40	4	0.03

t i m e i n w e e k s

45°C	glass	5	36	0.6	0.1
	linen	4	28	0.4	0.1
	wood	5	32	0.7	0.1