A POPULATION STUDY OF FIBRES FOUND ON BUS SEATS IN CRACOW

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ABSTRACT: The presented examination gives a further estimation of which fibre traces are common and provides background data, which are essential in fibre evidence evaluation. Since buses are a very popular means of transport in Cracow agglomeration, a study of different fibres on bus seats surfaces seems to be significant to the total population of recovered fibres.

Additionally, at present, Polish textile market is under transition and the obtainable results can be compared with these received for more stabilised (e.g. German, Swiss) markets.

Fibres were collected, with an adhesive tape, from seats of popular public bus lines in Cracow and they were classified according to their type and colour. More than 4000 recovered fibres were analysed using transmitted and polarised light microscopy.

The biggest amount of the identified fibres was natural. The most popular colour was colourless (37%), blue (26%) and green (13%). The most common fibre/colour combination in the fibres found on bus seats was colourless cotton (21%) and blue cotton (17%).

The examination confirmed that the synthetic fibres of an unusual colour collected as evidence could be considered highly significant.

KEY WORDS: Fibres; Bus seats; Fibres frequency; Fibres evidence.

Problems of Forensic Sciences, vol. XLVI, 2001, 249–254
Received 15 May 2001; accepted 15 September 2001

INTRODUCTION

The question: how common is a particular type of fibre trace? is one of the most important for forensic scientists when evaluating fibre evidence in court. In such a situation, the fibre examiner bases his/her answer on the results of previous studies and interprets it for his or her own use. Unfortunately, most of these research results are not fully acceptable, due to many changeable conditions which could influence the results obtained. There is reason to suppose that many of these conditions are country specific.

The most important factors are: the present state of domestic textile markets, climate, fashion and tradition, etc. At the moment, the Polish textile industry is in transition. Over the last several years it has begun to modernise

its products. Additionally, older products such as those manufactured from an acrylic fibre called Anilana are still in use. Domestic products, however, do not currently dominate the Polish market. There are many textile products from far-eastern countries (China, India, Vietnam), from Turkey and from Western Europe.

The study presented here is particularly important because of the lack of fibre frequency research in Poland and in countries with similar market conditions. Some other recent studies have examined the population of fibres on different types of seating [1, 2, 3, 4, 5].

METHODOLOGY

The Polish database was collected based on fibres found on the surface of bus seats, because buses are one of the most common means of transportation (especially in larger cities). The seats were taped in October/November 1999. The selected lines travelled to various parts of the city, passing the city centre. The air temperature during fibre collection varied from 4°C to 13°C, there was no rain, and a mild wind was observed.

All of the bus seats were upholstered with a textile material, which was different in different buses and was eliminated at the start of each examination.

The studies were conducted in two phases; in each, six randomly selected bus seats were taped. Adhesive tape was repeatedly applied to the upholstery of the bus seats, collecting 6 fibre samples from the bottom and 6 from the backrest of each. A total of 24 samples were prepared for examination. The areas to be examined were defined with the help of a specially made stencil, subsequently using a sample collection method based on random numbers. Fibres which lay both within and outside of the examined area were selected and transferred to slides only when more than 50% of their total length was inside.

A total number of 4111 single fibres were classified.

They were identified using: bright-field microscopy and polarised light microscopy. Fibres which didn't yield conclusive results under polarised light were examined using Fourier transform infrared microspectroscopy. Selected fibres, especially the control fibres which showed characteristic fluorescent qualities, were selected and eliminated using fluorescence microscopy. Fibres were identified and classified according to generic class and colour. They were classified according to 7 generally accepted categories of fibres: cotton, wool, other natural, polyester, polyamide, polyacrylonitryle, other man-made; and 9 categories of colour: colourless, blue, green, grey/black, red, violet, yellow, orange, brown.

RESULTS

The collective results of these studies, a compilation of those obtained from seats and backrests encompassing both phases of examination are presented in the following figures. Figure 1 represents the frequency of fibres according to colour. The most often encountered colours among the fibres analysed were colourless (approx. 37%), blue (approx. 26%), green (approx. 13%) and grey/black (approx. 8%). The remaining colours appeared much more rarely.

Fig. 1. Frequency according to colour.

The majority of collected and identified fibres (approx. 60%) were natural (Figure 2). From the particular generic class cotton (52%) and other man-made (this class encompasses e.g. viscose, acetate) (22%) were the most common.

In Figure 3 the frequency of particular fibre colour/class combinations decreases in the clockwise direction. Taking both generic class and colour into consideration, it was concluded that the overall majority is comprised of two categories of cotton fibres: colourless (approx. 21%) and blue (approx. 17%).

Other fibres appearing in significant amounts, i.e. approx. 5–8% are: colourless other man-made, green cotton, and blue other man-made. The remaining colour/class combinations collectively comprise less than 4% of all

Fig. 2. Frequency according to generic class.

Fig. 3. Frequency according to colour/class combination.

examined fibres. No fibres out of all of those examined fit into the following categories:

– yellow, violet and brown polyamide;
– blue, red, violet, yellow and green other natural fibres.

Fig. 4. Frequency of the most popular dyed fibres.

Figure 4 presents the simulation of the frequency of only dyed fibres e.g. those which are the most interesting for court experts. Blue cotton is of course the most popular but others in significant amounts are: green cotton and blue other man-made. Generally speaking, blue, green of grey/black fibres of different classes were recovered. From other colour's combinations only red cotton was presented in significant amounts.

CONCLUSIONS

The local database was collected and the authors showed which categories of fibres are or are not commonly encountered microtraces in Poland.

The methodology used can be applied for further examinations in other conditions.

Acknowledgement:
The authors would like to thank Mrs. Agnieszka Stefanik-Bednarz from the University of Economics in Cracow for her help in the realisation of this project.

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