TOXBASE: a microcomputer database for post mortem toxicology

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SUMMARY A cheap microcomputer program for the storage, retrieval, and analysis of the results of toxicological investigations on samples obtained at necropsy was devised. The program was written using FoxBASE+, a dBase III clone, which is both cheaper and faster than other comparable software. The hardware requirements are an IBM PC compatible microcomputer, preferably with both hard and floppy disc drives, and a suitable printer.

The system was found to be particularly useful when preparing reports for coroners and in retrieving data for administrators concerned with aspects of work in the laboratory. The system is flexible and can be readily adapted to other uses.

Toxicological examinations are carried out on specimens obtained at necropsy from about 180 cases in our department each year. Although a manual record system is adequate to cope with the routine processing of such a case load, we realised that a computerised database would greatly facilitate our ability to extract information about our work, both for administrative and research purposes. The ability to extract rapidly data about previous cases is of great value when reporting results. The price of commercially available databases was prohibitive. Thus we developed our own system.

Material and methods

For hardware we used an Opus PCII IBM PC compatible microcomputer with one 30 MB hard disc drive and one 360 KB floppy disc drive linked to an Epson LX-80 printer.

For software we used FoxBase+ (Fox Software Inc) which is a relational database management language with a command structure and syntax that are virtually totally compatible with the industry standard dBASE III plus. Applications written in dBASE III plus usually run without modification, and with a useful increase in speed, using FoxBASE+. TOXBASE was written using FoxBASE+.

At current list prices (May 1988) the equivalent hardware and software would cost £1665 (plus VAT) in the United Kingdom. Substantial discounts can usually be negotiated with suppliers.

SYSTEM DETAILS

Details of each case are held in a master record which records the deceased's name, age, date of birth, sex,

coroner, hospital and date of analysis, together with a linking record number. The assay results are held in 85 test data files. The data recorded for each assay result include the linking record number (which links a particular result to a particular case), sample type, nature of test, result and units of concentration. A free text file, again associated with a particular case by the record linking number, is also available for recording clinical details and comments on the results found.

The program is menu driven (fig 1) which facilitates its operation by a user with little previous experience of computers. Two levels of security are provided by means of passwords. The holder of a low level password may only interrogate the database. A different password is necessary before data can be added, modified or deleted. All case data are stored on floppy discs which are kept securely when the system is not in use.

When putting the results of a particular case into the database, the operator first adds the demographic

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Fig 1 Initial Menu Screen for "TOXBASE"

Menu

[1]	Add a record
[2]	Delete a record
[3]	Display a record
[4]	List for
[5]	Count for
[6]	Display last record
[X]	Exit program
[R]	Return to MS-DOS

Enter choice:

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Fig 2 Screen for addition of a new case to the data base

Addition Screen

Enter name:
 Enter age: 0
 Enter date of birth:
 Enter date of analysis:
 Enter sex (M/F):
 Enter coroner, etc:
 Enter hospital, etc:

Above information correct (Y/N)?

details of the deceased (fig 2). The option to enter a free text comment of up to 40 words is then given. Finally, assay results are entered. Any number of assays for each case may be added and any number of sample types for each assay. Once the details of a case have been entered they may be retrieved using either the deceased's name or the linking number. The list option (fig 1) produces lists of results according to criteria specified by the operator. Thus it is possible to find, for example, all previous cases where diazepam and cyclizine were detected.

Discussion

As others have reported,¹ dBase III is a suitable programming environment in which to develop small database systems for pathology. FoxBASE + is much cheaper and has the additional virtue that, while maintaining compatibility with dBase III, applications operating under FoxBASE + run considerably faster. Compilers such as Clipper (Nantucket Corporation) do speed up the operation of dBASE III programs, although even after compilation, they do not run as fast as they would under FoxBASE +. Use of an external compiler means that the interactive quality, which is one of the attractions of developing applications using dBASE III or FoxBASE +, is lost.

With more than three years' data (582 cases) now stored in our system, the speed of operation of FoxBASE + is more than adequate when typing new data in, although it may take several minutes to generate a report as the system searches through files held on the relatively slow floppy disc drive. The speed of the search depends on the number of cases positive for the first parameter specified when the search is initiated. For example, a search to identify all cases in which dextropropoxyphene and alcohol had been found took six minutes, whereas a search to find all

Table Concentration in blood of certain drugs found in fatal overdose*

Drug	No of cases	Blood concentration (mg/l)		
		Lowest	Mean	Highest
Dextropropoxyphene	45	0.15	3.86	44.0
Temazepam	28	<0.1	2.77	15.0
Dothiepin	26	0.08	3.5	15.2
Diazepam	23	<0.025	0.49	3.85

*More than one drug may be present in a particular case.

cases involving both verapamil and alcohol took 18 seconds.

Dextropropoxyphene is one of the most common poisons in our practice (table) and verapamil one of the least common. Such searches could be speeded up by storing the data on the system's hard disc. We have chosen not to do this as it would lead to a substantial reduction in the security of the data in our particular working environment, where so many duplicate keys are in circulation that a locked door is no barrier to a miscreant.

An increase in speed, probably by a factor of 4 or more, would be achieved by using an IBM PC-AT based clone with a 30286 central processor. This would increase the hardware and software cost of the system to more than £2000.

We have found the system particularly useful as an aid in preparing reports for coroners and others. It is now possible to incorporate into reports not only reference ranges quoted in standard textbooks, but also to retrieve from the database all similar cases examined by the laboratory and to quote their number and the range and modal or mean values for the concentration in blood of the particular drug under consideration (table).

Apart from its use in practice and research, the system is also useful in helping to meet requests for information from administrators concerning aspects of the work of our laboratory.

The system is flexible and can easily be adapted to other uses. For example, it is very suitable for recording the results of analyses of urine samples submitted to the laboratory for screening for drug abuse.

K R is an undergraduate student at Leicester Polytechnic and has been financially supported by a grant from West Glamorgan Education Authority during his secondment to the Royal Hallamshire Hospital.

Reference

- 1 Suen WM, Chick KW. Use of microcomputer for histopathology: system using IBM PC and dBASE III. *J Clin Pathol* 1988; 41:220-2.