DETECTION AND DETERMINATION OF ALCOHOL AND DRUGS

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A detailed, extensive and wide-reaching presentation is made. Four categories of instrumentation for breath analysis are discussed and the underlying chemical and physical principles are detailed. Screening devices as well as instruments for quantitative evidential use are described, their application to problems of law enforcement and their different uses, for collection and storage of samples and preliminary or semiquantitative screening in the field to exact determination in the laboratory for forensic or scientific purposes. In many countries a routine has developed where a preliminary screening is carried out by the police in the field. In some instances breath samples are collected in the field, to be analyzed at a later time in the laboratory, a procedure comparable to the taking of blood samples at the police station and sent for analysis to the laboratory. Other equipment, accessories, are described, for calibration, adjustment and testing of devices.

The development is shown from chemical reagents in the tube to wet chemical in the now classical Breathalyzer, the new devices based on infrared (IR) photometry, fuel cell electrochemical determination or sensor solid state instruments. Many of these new devices allow a determination to be made within 5-15 seconds, and be repeated at 1/2-2 min intervals; they are readily portable, have their own power and can be taken to the field or used in the police station.
Very extensive test programmes of a large variety of instruments have been carried out over the years. Their variability, expressed as a coefficient of variation, (stand. dev. in per cent of mean) is one useful parameter to serve as a measure of the reliability and reproducibility of an instrument. About 10 per cent relative standard deviation is what is achieved by analytical techniques for clinical purposes; many breath instruments will go down to 5 per cent in a laboratory setting.

For most screening devices the limiting factor is not the ability of the device to measure whether alcohol is present and if so, how much, the problem is almost universally the adequacy of the sample. the breath collection and the breath handling; the analytical part of it is often straightforward. Differences in breathing techniques, the way of obtaining a sample of deep-lung-air, of alveolar air, or mixed exhaled air, and other variables of this kind play an important role.

Storage problems were discussed at length, and Prof. Dubowski referred to his presentation of a storage technique in the Analytical Section.

Examples of detailed testing programmes of different instruments are given and discussed. Standards for acceptance of new instruments have been set up by a federal agency within the US Dept. of Transportation, and programmes are outlined how to assess whether an instrument meets the specification or not.

The blood/breath ratio and its variations was discussed in detail. The assumed value is 2100:1, the results from Prof. Dubowski's laboratory point to a somewhat higher value, 2280:1. The forensic significance of using one or the other was elaborated on.
Time was also devoted to quality control, safeguards to guarantee the proper procedure to use, and other means to be used as the basis for the forensic use of the analytical procedures and their results in court.

Finally methods of blood alcohol analysis and analysis of drugs other than alcohol, including radioimmunoassay, were presented, and reference was made to Prof. Dubowski's paper on the subject in the Plenary Session. The problem of interpretation of results, their biological importance, and application for forensic purposes and the translation of results obtained in one medium to another, e.g. from breath to blood, were also elaborated.

References, tables and diagrams will be published separately.

(Summarized by the editor)