B166 Techniques in Drug Sampling

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After attending this presentation, attendees will understand various ready to use sampling techniques available in the scientific literature. Although in this presentation drug analysis is being used as an example, nevertheless the sampling techniques discussed here can be employed in any other situation, as they are quite generalized. No specific technique is suggested/recommended to any specific laboratory or person, as techniques vary depending on the purpose of usage and the local legal and scientific/technical requirements.

Unfortunately, as of today most of the forensic laboratories, involved in drug analysis, especially those in the big cities are 'buried' under the 'heaps' of drug cases waiting for analysis. With the aim to alleviate this present unhealthy situation, various sampling techniques available in the literature are reviewed. This presentation will impact the forensic community and/or humanity by demonstrating some very powerful techniques, which have the potential to solve the drug backlog problem, while at the same time fulfill legal/scientific requirements.

In recent times, with the increase in quality, there is also a tremendous increase in the quantity of the drugs being seized in the United States. This puts a large burden on the law enforcement agencies and especially the drug laboratories throughout the country. This entails a long and chronic backlog of cases to be analyzed by the concerned drug laboratories, which have to be cleared in a court specified time period.

This critical situation brings home the need to employ appropriate scientific/statistical sampling techniques, which would not only satisfy the legal requirements, but also help alleviate the present backlog problems.

A broad review is presented of the various sampling techniques available to a drug chemist to choose from, depending on the situation.

(i) Is a drug present in (more than) a specified proportion of the items? This means increased sampling; or (ii) Is a drug present in all the items? This means maximum sampling (this will require full analysis of all items, which will lead to unrealistic costs, especially for large number of units; or (iii) Is a drug present? This means minimal sampling (this may require one positive result). Selection of any of the above three criteria, depends on the chemist and also on the legal and scientific/technical situations.

Before selecting a sampling technique for its application, one has to ensure that two principles are maintained, which are quite important, viz: (i) the properties of the sample are a true reflection of the properties of the population from which the samples were taken, and (ii) each unit in the population has an equal chance of being selected.

Technical definitions concerning the sampling in a typical drug case, like seizure, population, unit, sample, mean (both mean of a population and sample) and standard deviation (both standard deviation of a population and sample), are explained.

The various sampling methods applied in drug laboratories in the United States and in other parts of the world include, n=N, n=0.05N, n=0.1N, n=square root of N, n=square root of N/2, n=20+10%(N-20) and n=1 (where 'n' is the sample size and 'N' is the total population) are shown. Advantages and disadvantages of each one of them are discussed.

The popular square root method recommended by International Drug Control Programme of United Nations and accepted by AOAC International, is also elucidated.

Broadly there are three major statistical sampling techniques, like the hypergeometric distribution, the binomial distribution and the Bayesian approach. Results obtained by applying hypergeometric distribution are discussed. Interestingly, with increasing sample size, the Law of Diminishing Returns (wherein, after certain proof (~70-80 %), further increase in sample size does not concomitantly increase the number of positives) become more significant. Hence, as a caveat, the drug chemists should particularly bear this in mind, when deciding a sampling size.

Last but not least, the reason why sampling techniques are important in a given situation is highlighted by the following dramatic statement, "If one sample out of a population of 10 is taken, and the analysis of the sample shows cocaine, the hypothesis that this is the only one containing cocaine is much more unlikely (10 %) than the hypothesis that the majority of the 10 items contains cocaine (more than 50 %). (Source: European Network of forensic Science Institutes Drugs Working Group. "Guidelines on Representative Drug Sampling" 2003 P30).

Sampling Techniques, Hypergeometric Distribution, Drug Analysis

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