B73 Techniques in Drug Sampling

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After attending this presentation, scientists and chemists, especially those working in drug laboratories, will get an opportunity to learn about the various internationally recognized sampling techniques available for them to be employed, to solve the problem of analyzing large drug cases, those containing multimple units/items of CDS.

With the phenomenal increase in drug seazures across the country, in recent times, it is becoming imperative on the drug laboratories in U.S. to employ appropriate sampling techniques, which are not only internationally recognized and scientifically sound but also fulfill the legal requirements.

From the practical point of view, this presentation will impact the forensic science community by presenting here, a set of ready to use sampling techniques which while satisfying the above requirements, dramatically reduce the actual sampling size during drug analysis, and hence capable to in turn solve the problem of chronic backlog of drug cases waiting to be analyzed in a specified time.

In recent times, with the increase in quality of drugs, 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 specially the drug laboratories throughout the country. It entails a long and chronic backlog of cases to be analyzed by the drug laboratories, as one seen in author's lab, and that too has 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 us alleviate the present backlog problems.

The author will present here a broad review of the various sampling techniques available to a drug chemist to choose from.

Depending on the situation, in a sequence of increasing workload, if one is required to prove: (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 prevailing local legal and scientific/technical situations.

Before selecting a sampling technique for its application, one has to bear in mind to ensure that two principles are maintained, which are quite important, viz: (i) the properties of the sample are 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.

General/basic 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 elucidated.

The various sampling methods applied in drug laboratories in U.S.A. and in other parts of the world like, 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 entailing each one of them are discussed.

The popular square root method recommended by International Drug Control Program 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, drug chemists should particularly bear this in mind, when deciding the size of the sample.

Nevertheless, last but not least, the reason why a typical sampling technique gains importance in a given situation is highlighted by the following dramatic statement, which states that "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 ten items contains cocaine (more than 50%)." (Source: European Network of forensic Science Institutes Drugs Working Group. "Guidelines on Representative Drug Sampling" 2003 P30).

Drug Sampling Techniques, Square Root Method, Hypergeometric Distribution

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