NASA TECH BRIEF

Langley Research Center

Micro-Organism Distribution Sampling for Bioassays

The numbers and types of naturally occurring micro-organisms on surfaces are obtained by assay samples, taken either by swabs or by immersion and the ultrasonic treatment of representative portions. An acceptable sampling distribution must be available to relate observed assays to the number of micro-organisms on a surface at the time of sampling before any valid statistical inferences can be made. This study provides the basis for the development of such a probability distribution, including its mathematical form, the rationale for selecting that form, the techniques for estimating the parameters of the distribution, the verification of the resulting distribution using goodness-of-fit tests, and the methods (both exact and approximate) for computing confidence intervals.

The purpose of this sampling distribution is to characterize the sample-to-sample variation in order that statistical tests may be applied, to estimate the error due to sampling (confidence limits) and to evaluate observed differences between samples. It would be useful in processing bioassay data from any source. In addition to processing data taken from spacecraft hardware, this distribution could be used for bioassays taken in hospitals, in breweries, and also in food-processing and pharmaceutical plants.

The sampling distribution for bioassays was developed from the assumption that micro-organisms occur on surfaces in clumps which are distributed randomly and independently. The number of micro-organisms per clump has a probability distribution specified by three parameters: the probability of one organism, the probability of two or more, and the maximum number of organisms per clump. This distribution has produced an acceptable goodness-of-fit to bioassay data from the Mariner 1969 space missions, and it was used to compute confidence limits for the number of micro-organisms present.

Note:
Requests for further information may be directed to:

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NASA has decided not to apply for a patent.

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