

Microbial Air Sampler Sampl'air Testing Reports extracts from

Physical and Biological Efficiency Testing of Sampl'air Lite Microbiological Air Sampler Using Techniques Described in ISO14698-1

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"The physical efficiency of the Sampl'air microbiological air sampler for collecting bacteria-laden particles of various sizes have been compared with membrane filter samplers using the techniques described in ISO14698-1. The samplers were operated simultaneously in a controlled room where they were challenged with airborne bacteria.

Uniform sized particles of different diameters containing bacterial spores were generated into the room. The results showed that the Sampl'air sampler was efficient (115.9 – 135.1%) for collecting particles containing bacterial spores in the size range of 2.5 microns and above. However, the sampler efficiency decreased with particle sizes 1.3 microns and less (60.5 -66.2%). At higher particle sizes the sampler was more efficient than the filter samplers probably due to its higher inlet efficiency at these particle sizes.

The biological efficiency of the Sampl'air was compared to that of the Casella slit sampler, a commonly used reference sampler. The biological efficiency was measured as the comparative efficiency of collection of *Staph epidermidis*, a common human-associated clean room contaminant and the extremely aerostable *B. atrophaeus* spore. The biological efficiency measured was 80.7% (standard deviation of 37.7%) of that of the Casella sampler. When measured by a paired t-test, this difference was not found to be statistically significant. The biological efficiency of the Sampl'Air is typical of this type of impaction sampler.

INTRODUCTION

Determination of the microbiological quality of air is vital in a number of sites such as areas where pharmaceuticals and medical devices are manufactured, operating theatres and other critical areas in hospitals and food processing facilities. In many cases only sparse concentrations of airborne micro-organisms are present in these locations and this means that large volumes of air (1m³) have to be sampled to collect sufficient numbers of micro-organisms for a proper quantitative assessment to be made. Accurate measurement of microbial contamination of air is also dependent on obtaining a representative sample from the air and limiting any losses that may occur between the sampler and the assay system. Losses can occur either due to a failure of the sampler to capture particles containing micro-organisms (physical loss)

or due to inactivation of viable micro-organisms during collection so that formation of visible colonies on agar surfaces will not occur (biological loss).

The Sampl'Air Lite sampler is an impactor type of instrument based on the principle described by Andersen (1) in which air is aspirated through a plate perforated with a pattern of 256 small holes. The resulting air streams containing microbial particles are directed onto the agar surface in a standard petri-dish (diameter 90mm). When the pre-set sampling cycle is completed the plates are removed and incubated. Viable organisms which form visible colonies are then counted.

Efficient removal of particles containing micro-organisms from the air and their collection onto medium for identification often depends on the sizes of the particles. At present no sampling system or device has been considered a reference method to which other samplers can be compared. ISO 14698-1 (2) recommends using a membrane filter sampler as the standard method. In filtration systems, accurately measured volumes of air are drawn through filter material of low pore size so that all particles containing micro-organisms are deposited by impaction and interception. Provided that the micro-organisms are resistant to desiccation by drawing air through the filter material, this simple method can be used as a standard method by which the physical sampling efficiencies of other samplers can be determined. Bacterial spores of *Bacillus atrophaeus* NCTC 10073 are selected as the challenge micro-organisms because they are known to remain viable in aerosols and are not inactivated by desiccation during collection on membrane filters. They also form very characteristic orange colonies which are easily identified after overnight incubation. The number of bacteria collected on membrane filters can be counted by simply placing the filters on an agar surface and incubating. The physical efficiency of the Sampl'air Lite to collect airborne particles of various sizes can therefore be determined by comparison with the membrane filtration samplers operating side-by-side. This has been carried out in a controlled environmental chamber by generating the bacterial spores in particles of uniform size. The sizes of the particles containing the bacterial spores generated are determined using a cascade impactor (3) which fractionates the particles of different sizes during collection. The biological efficiency of a sampler is a measure of how effectively it can collect micro-organisms on an agar plate in such a way as the micro-organism will subsequently form a colony. The biological efficiency depends on many factors including the micro-organism used, how it is grown, how it is aerosolised, what it is aerosolised in, the relative humidity of the environment etc. ISO 14698-1 suggests that the common human derived environment contaminant *Staphylococcus epidermidis* is used as an indicator of biological efficiency. In this study the biological efficiency of the Sampl'air Lite is compared to that of the reference Casella slit sampler. To measure the biological efficiency, the ratio of recovery of *Staph. epidermidis* to the aerostable *B. atrophaeus* was determined for the Sampl'air and Casella sampler..."